DECEMBER • 1960

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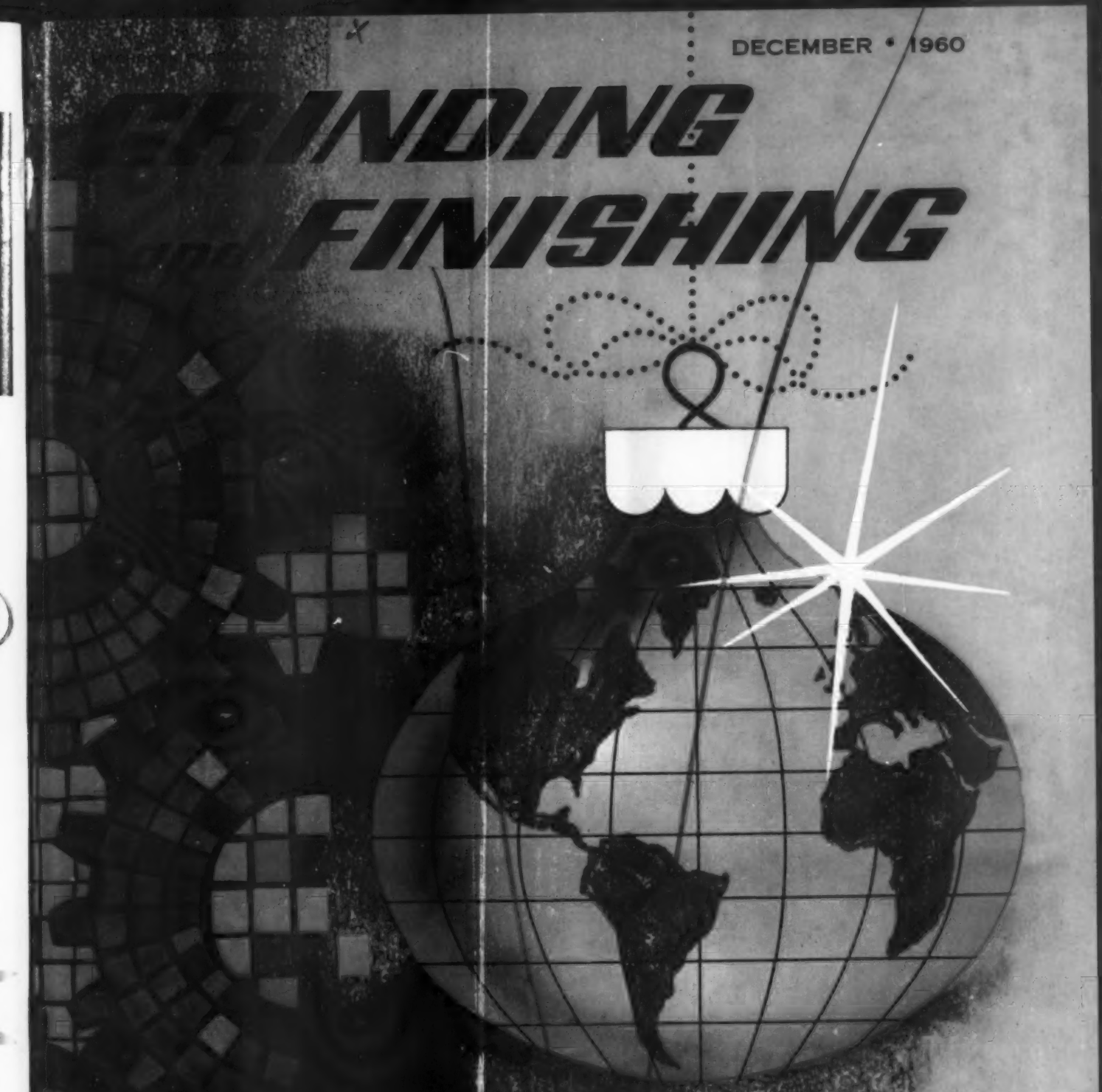

CREED FOR TODAY:

Prove all things; hold fast that which is good

See Christmas Editorial

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YOURS.....

a library of literature on

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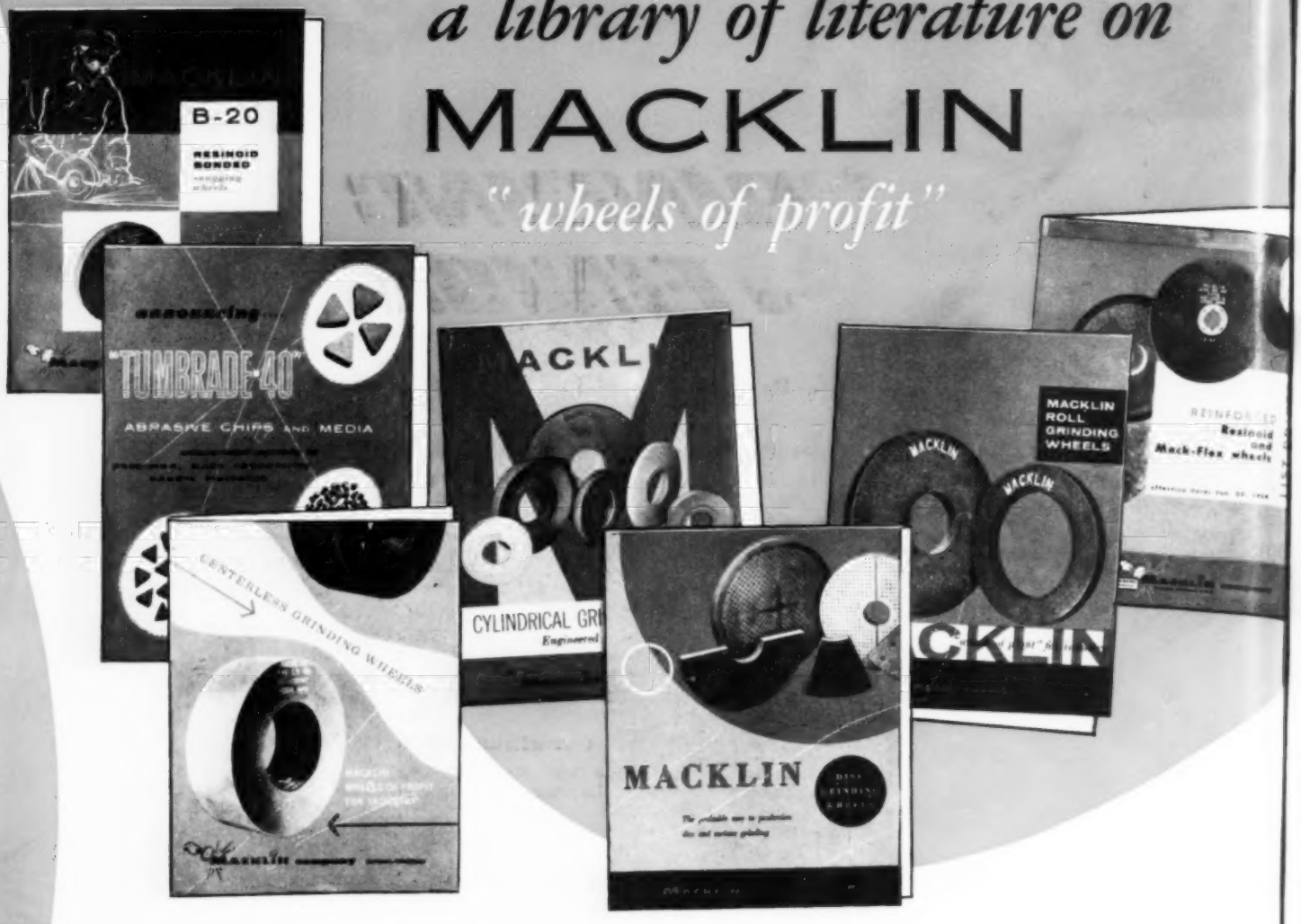

Looking for new economies in your production grinding? The answers you've been looking for may well be in this new Macklin literature. It contains specific wheel recommendations for various operations, and is documented with actual case histories showing cost-saving applications.

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Literature on ( ) Snagging Wheels ( ) Tumbling Media
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GRINDING WHEELS

MACKLIN company

Dept. 63, Jackson, Michigan

WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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26 How Planning Built A Modern, Efficient Barrel Finishing Department At Shakespeare

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By M. M. Patterson

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From dies to tools, the tool steels used have their own peculiar grinding requirements. Starting wheel specifications are discussed for each group of tool steels.

By John A. Mueller

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December Cover: It may be an oversimplification to sum up the world in a Christmas tree decoration and the turning gears of industry in a mosaic. But the Christmas season is a time when we think in terms of a basic concept—peace on earth, good will toward men—that can bring about a better world. This is a time when in spite of all the current turmoil we reaffirm our faith and renew our hope for the kind of world that was heralded in that phrase nearly 2000 years ago.

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From Norton... Higher Speeds for Faster Grinding ...Cylindrical or Surface

For your cylindrical grinding

. . . Norton brings you cylindrical grinders which provide a new higher wheel speed of 8500 SFPM. In test after test Norton Machines using "high-speed" Norton wheels have proved their ability to operate at this new high speed — safely, steadily and with production advantages never obtained before.

These Norton cylindrical production grinders — now called the Series 8500, and so identified with a name plate — include the Type CTU Cylindricals, Angular Wheel-Slide grinders, No. 2 Centerless and the Type CP-1 PLUNG-O-MATIC®. Similarly, Norton high-speed wheels have been tested and approved for 8500 SFPM and carry the new checkered-flag stencil.

Remember: *it took a great deal more than stepping up spindle speeds to assure the greater productivity of Series 8500 machines.*

Fluctuations in wheel energy, mechanical energy, tangential force and many other factors had to be carefully considered before final approval of designs.

As a result, Series 8500 grinders produce more pieces-per-hour at lower cost-per-piece . . . provide finer finishes for improved product quality . . . and their higher speed reduces wheel dressings for longer wheel life and lowered wheel cost.

For your surface grinding

. . . Norton Type S-3 hydraulic surface grinders are now available with table speeds stepped up to a new high of 150 FPM.

This is another Norton achievement to bring you faster production than ever before. And, like the Series 8500, the Type S-3's are engineered to provide better production and product quality as a benefit of higher table speed.

Available in 6″ x 18″ and 8″ x 24″ sizes, Type S-3 surface grinders are fast and accurate on long production runs or toolroom grinding. They handle taller workpieces . . . are equipped for fast positioning, better sighting and loading . . . and their faster table speeds mean less heat damage to workpieces.

Only Norton provides 150 FPM table speeds on surface grinders.

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District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

Only Norton provides 8500 SFPM wheel speeds on cylindrical grinders.

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Editor's Mail

Armco President Urges Revised Depreciation Policy

Logan T. Johnston, president of Armco Steel Corporation, recently urged the accounting profession to lend its knowledge and prestige to industry's efforts to revise U. S. depreciation policy. He spoke at the annual meeting of the Ohio Society of Certified Public Accountants.

Johnston told the group that the U. S. is severely handicapped in foreign trade because depreciation allowances do not permit American industry to improve its plants as rapidly as manufacturers abroad. **"In major industry, at least, most foreign plants are already quite as modern as American plants, and in many cases they are superior,"** he said.

"We simply cannot afford to modernize fast enough to keep pace with our foreign competitors, and at the same time maintain a fair rate of return to the owners of the business," he stated. **"Depreciation allowances, which do not recognize the effects of inflation, and place barriers in the path of industrial growth, are largely responsible."**

He continued, **"American industry does not want, nor does it need any special privilege. But it is important that handicaps which retard our participation in world markets be dealt with intelligently."**

The steel executive pointed out that foreign industry also has the benefit of lower wage and tax rates, and that it can build its plants at lower cost than American manufacturers.

U. S. industry no longer has a built-in assurance that it can sell its products abroad, Johnston pointed out. **"From now on we shall have to compete overseas just as we compete with one another here at home,"** he said.

The Armco president asked for a stepped-up world trade effort based on an anti-inflation policy in the U. S., and using the same forward-looking management techniques that have been successful in this country.

"A negative approach calling for higher protective tariffs, more stringent trade restrictions, and reduced import quotas will not solve the problem," he declared.

Instead, he advocated greater emphasis on market research abroad, merchandising adapted to the local scene, product research to tailor products to foreign markets, a fresh examination of foreign credit policy, and liberalized depreciation allowances.

In Looking at Depreciation Do Not Overlook the Engineer

While financial and accounting personnel administer corporate depreciation policies and methods, engineers probably are best fitted to estimate effects of technological change and obsolescence in machinery.

This is the view of Maurice E. Peloubet of the New York accounting firm of Pogson, Peloubet & Co. Writing for "The American Engineer Magazine," the internationally known accountant says of the engineer:

"He is best fitted to determine the extent of physical wear and tear and the type of machine which should be bought to replace one which has become obsolete or which has worn out."

Peloubet also noted that if a "capable and impartial engineer" makes a periodic examination of useful lives of machinery the Internal Revenue Service will generally accept the results.

Of all the professionals serving business, the engineer is the one who should be consulted first and most frequently in the determination of depreciation rates and policies, according to Peloubet.

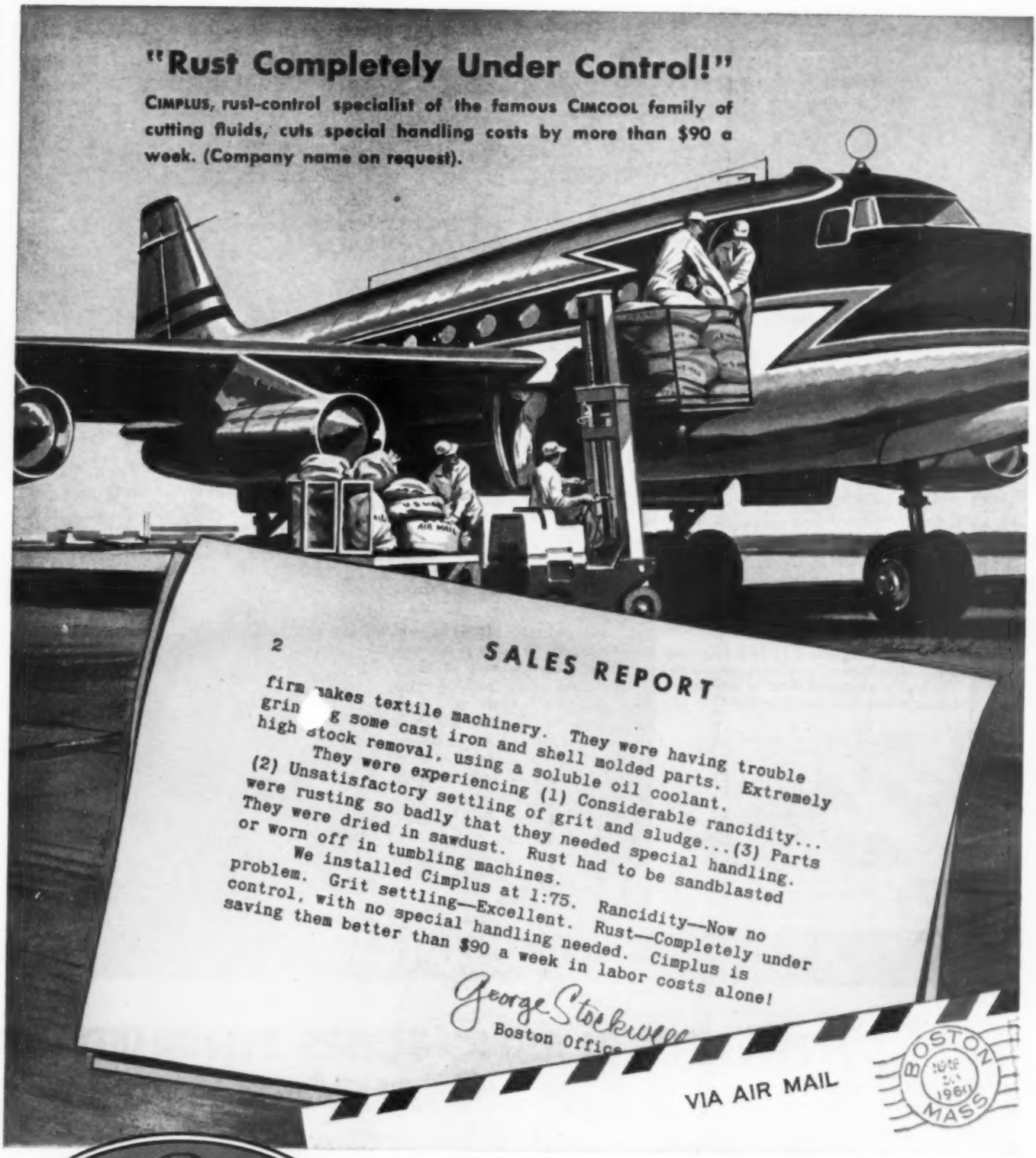
"This, however, is seldom the case," he writes in American Engineer. **"The field of depreciation seems to be preempted almost entirely by economists, accountants and lawyers."**

Eleven witnesses on depreciation appeared before the House Ways and Means Committee in the November, 1959, hearings. None was a professional engineer. **"Instead there were six economists, three accountants and two lawyers,"** he declared. • • •

DON'T BE SURPRISED when you pick up your copy of the January issue . . . and see a big bold **"CAUTION"** on the wrapper. It is just a reminder that January is "verification month" for this magazine. Please fill out the form on the wrapper and mail the entire wrapper to us. It is vital to our audit . . . and will assure your continued receipt of GRINDING and FINISHING.

"Rust Completely Under Control!"

CIMPLUS, rust-control specialist of the famous CIMCOOL family of cutting fluids, cuts special handling costs by more than $90 a week. (Company name on request).


2
SALES REPORT
firm makes textile machinery. They were having trouble grinding some cast iron and shell molded parts. Extremely high stock removal, using a soluble oil coolant.
They were experiencing (1) Considerable rancidity... (2) Unsatisfactory settling of grit and sludge...(3) Parts were rusting so badly that they needed special handling. They were dried in sawdust. Rust had to be sandblasted or worn off in tumbling machines.
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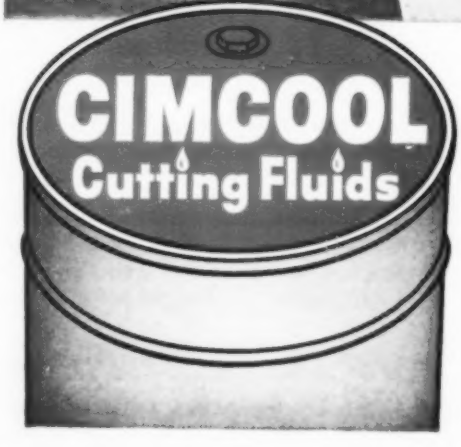

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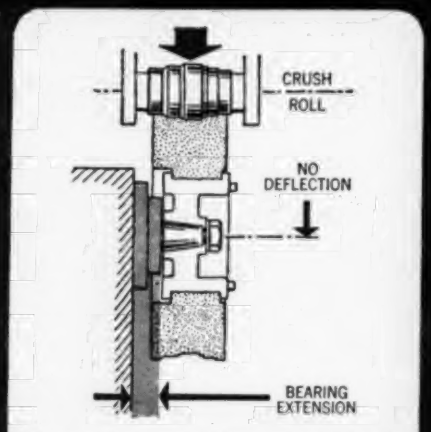
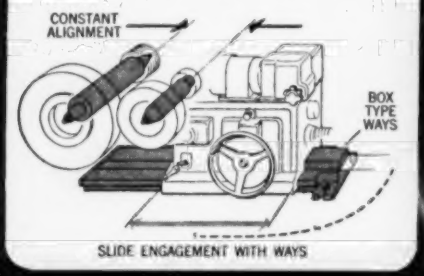
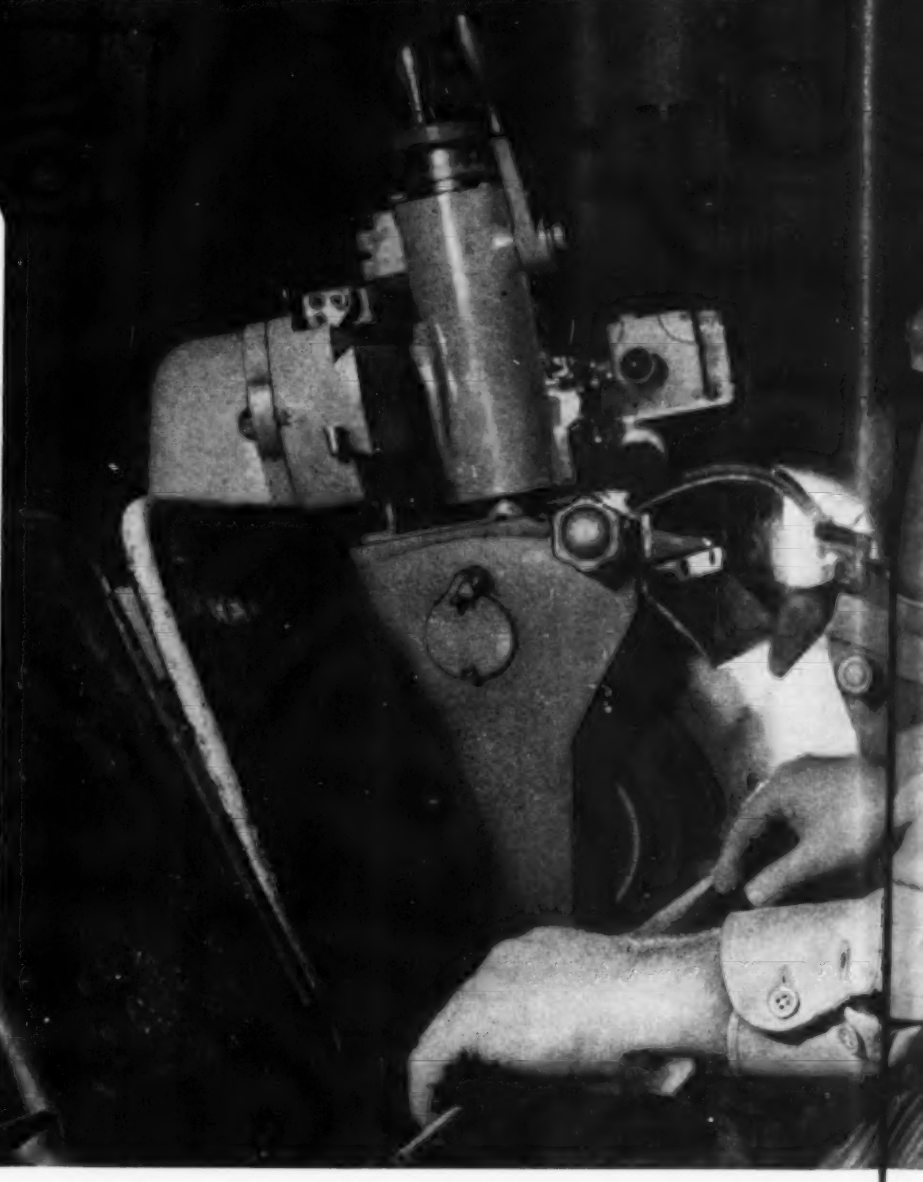
All industry is talking about the new Van Norman



Rugged, heavy Grinding Wheel Spindle with its additional bearing extension withstands the terrific pressures of crush roll forming with NO DEFLECTION.

Maintained alignment of Grinding and Regulating Wheel Spindles is assured by the high engagement ratio of the Regulating Wheel Slide length to width.





SYNTHANE PLASTIC TUBES FINISHED TO AUTOMATICALLY...

VN Diversimatic Centerless Grinder delivers greater precision, finer ... costs less to buy,

Synthane Corporation cut production costs of their small (under ½ inch O.D.) laminated plastic tubing when they switched to a VN Diversimatic Centerless Grinder. This low-priced, low-maintenance VN grinder is so exact that they can rely on machine accuracy to finish the tubing O.D.

Maintained Precision Assured—Secret of VN's exact grinding accuracy is its anti-friction grinding and regulating wheel spindles, which assure maintained precision in the workpiece under *any* conditions.

Faster Set-Ups . . . Increased Production . . . Greater Accuracy. The Van Norman Centerless Grinder is specifically engineered to produce more precision grinding work per operator per work shift . . . designed for in-feed

VAN NORMAN

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EXACT TOLERANCES ECONOMICALLY

tolerances in small diameters less to maintain

work, thru-feed work, crush form grinding and profile work. The Van Norman Centerless Grinder is rugged, and designed for heavy duty, long run production.

Send For Free Booklet—"Centerless Grinding," your local VN Franchised Distributor will be happy to discuss how VN Centerless Grinding may increase production and cut costs for you . . . call him NOW.

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VN

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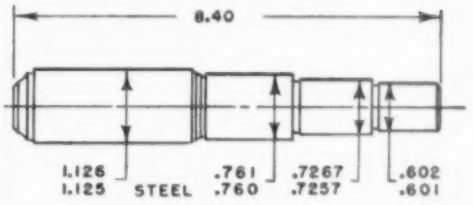
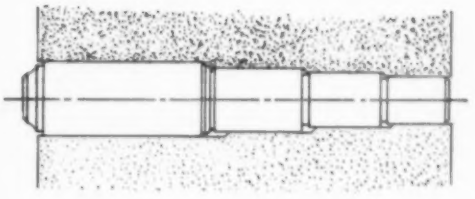
Another typical Van Norman centerless grinder cost-saving application

CUSTOMER'S PROBLEM:



A prominent automobile manufacturer wanted to grind all diameters on worm shafts. The problem was more difficult because the part did not have the same hardness throughout its entire length. Automatic cycling was required as well as post-operational gauging with feed back to machine for size compensation.

VAN NORMAN SOLUTION:



A Centerless Grinder with a Hydraulic Diamond Dresser was used to grind this part. Three operations were used because of the large amount of stock removal required, and also because of intermediate operations such as hardening and thread milling. These operations were:

1st Operation—Grind all diameters to +.012/.011 in soft state.
2nd Operation—Grind all diameters to +.002/.003 after hardening.
3rd Operation—Final grind all diameters to size.

THE RESULT:

Complete customer satisfaction. The machine functioned as planned. Production was as follows:

1st Operation—120 pieces per hour at 100%.
2nd Operation—180 pieces per hour at 100%.
3rd Operation—240 pieces per hour at 100%.

Two Van Norman machines are now in use on this job.

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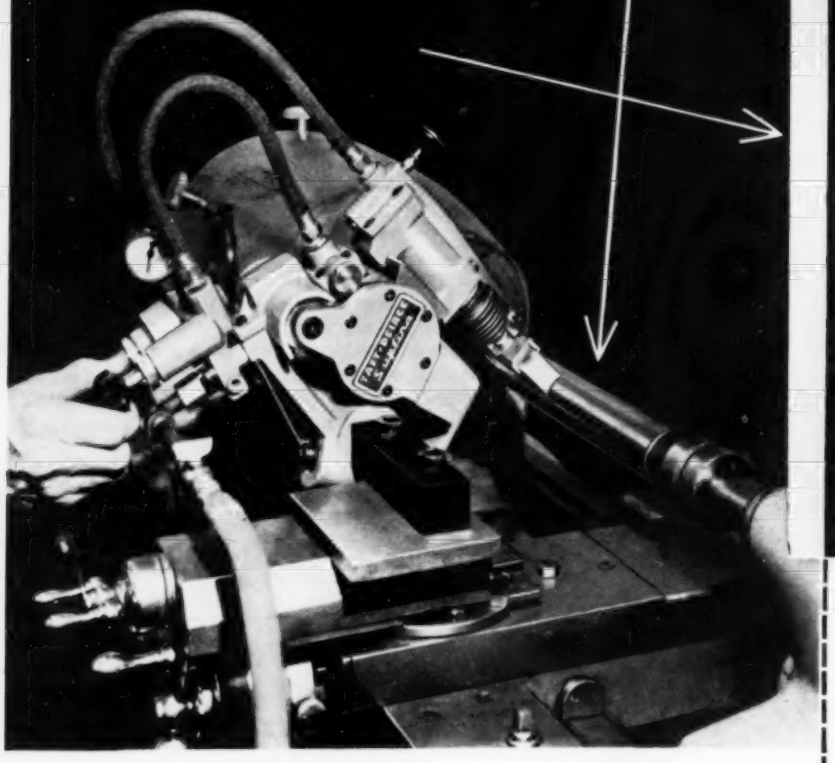
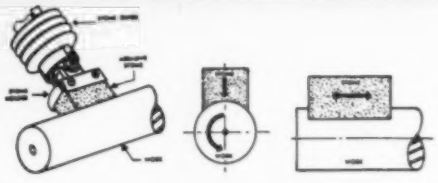
THE NEW WORD IN METALWORKING IS MICROSTONING!

NOW! SIMPLIFIED, LOW-COST CORRECTION OF SURFACE GEOMETRY WITH TAFT-PEIRCE/SUPFINA MICROSTONING



This dramatic "before and after" evidence on a Talyrond chart shows how Microstoning corrected the surface geometry of a die set guide pin. The outside trace shows an average roundness of .00028" as ground. After Microstoning (inside trace), the roundness was improved to an average of .000030"



Here's what happens . . .

Microstoning is a low-pressure, low temperature abrading process using stones of various grit sizes. Stones are placed against the work with light pressure and vibrated from 1900 to 2500 times a minute as the workpiece rotates. The stones shape themselves to the mean radius of curvature, and more pressure is applied at high spots. This produces a fast and simplified correction of surface geometry that is demonstrated graphically by the Talyrond chart above.

Microstoning with Taft-Peirce/Supfina machine tool attachments produces a controlled microinch surface finish, removes cutting tool marks and grinding flats, and dramatically improves roundness.

The unique, patented Supfina design makes this precision surface correction possible. A free-floating piston, driven by compressed air oscillates an abrasive stone at high frequencies against the work — to achieve both desired finish and geometric correction in ONLY ONE OPERATION! All types of metals can be microstoned as well as hard plastics and other nonmetallic materials.

Try Microstoning on your product! Taft-Peirce/Supfina Attachments are low in cost and simple to operate. They can be used on lathes, boring mills, planers and other machines — to produce a precision surface and improve the performance of spindles, sealing rings, metal processing rolls, and bearing surfaces. Microstoning can be used on both flat and round surfaces. Contact your nearest Taft-Peirce Machine Tool Dealer for full information or write direct.

Finish it with **TAFT-PEIRCE** *SUPFINA*

TPP-19

TAFT-PEIRCE MANUFACTURING CO., 19 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND

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3M Abrasives Cut Costs of Steel Utensil Finishing

Nationally famous, "Ekcoware" cooking utensils are manufactured here in the housewares division of Ekco Products, Inc., Massillon, Ohio. Prior to color buffing, these copper-clad stainless steel pans are given a final polishing.

Abrasives Ekco formerly used for this final finishing required a considerable amount of "break-in" time and caused many pan rejects.

Now, thanks to a 3M Representative's suggestion, Ekco has switched to 3M "PG" Wheels. The results have been remarkable. "PG" wheels have upped production 20%, eliminated one handling operation, reduced rejects, and produced a better finish on the pans. There's no "break-in" period either, as 3M "PG" Wheels maintain an even cut from installation to throw-away point.

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase production. Discover:

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

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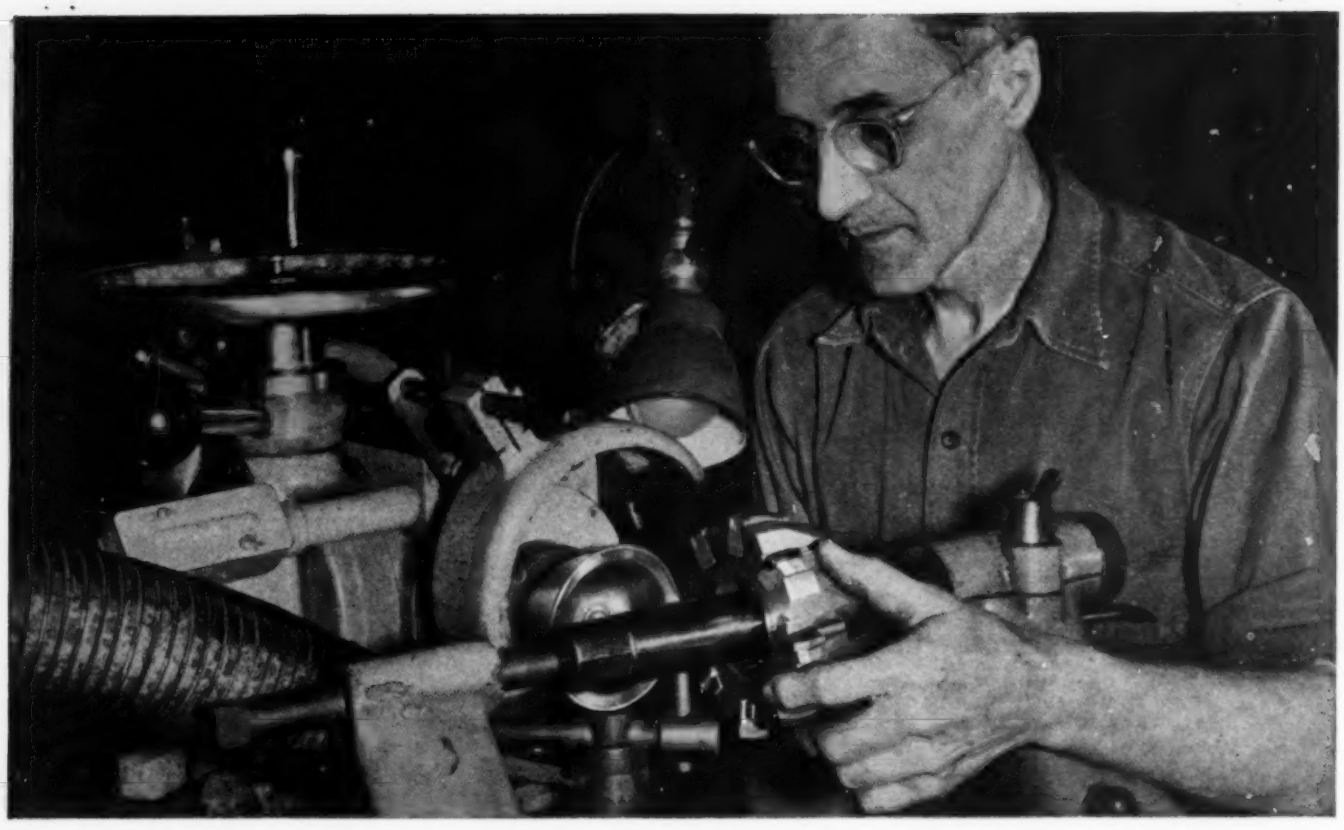
Why General Electric Man-Made diamonds are better for you

Multiply output per grinding wheel with G-E Man-Made diamonds



Diamond wheel users report that General Electric Man-Made diamonds increase production-per-wheel; reduce costs!

Right! You *can* multiply output per grinding wheel with wheels containing General Electric Man-Made industrial diamonds.

General Electric Man-Made diamonds are of controlled, uniform structure, shape and quality. Wheels containing G-E Man-Made diamonds give you longer wheel life, lower grinding cost per piece, and consistent superior performance.

And, General Electric Man-Made diamonds – with optimum friability and shape – can multiply the output of your grinding wheels in all resinoid and vitrified grinding applications. Everything from carbide burr grinding to the grinding of carbide and steel mixtures (even up to 50-50 ratios!).

Wheels containing G-E Man-Made diamonds (Type RVG) are readily available for every resinoid and vitrified grinding operation. Check with your supplier. Or write: *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Street, Detroit 32, Michigan.*

THE PROOF IS IN YOUR PLANT!

An automobile manufacturer in a tool and cutter grinding application used 5" x 1¾" x 1¼" flaring cup wheels, resinoid bond, 100 concentration, 100 grit – dry grinding. Man-Made diamond wheel turned out 1217 cutters – and still had one-third of the wheel left! Natural diamond wheel produced only 696 cutters – a superiority of 162%, Man-Made over natural!

Prove it in *your* plant!

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CHRISTMAS EDITORIAL

Prove all things;
Hold fast that
which is good

1 Thessalonians 5:21

Do we need to be admonished, at this Christmas season, to prove our faith and our belief in God? In the broader sense, is it necessary to prove our trust in liberty and freedom? Konstantin said, "The hero never ceases to prove his courage and his faith; when he merely accepts, he becomes a mouse among the lions".

Isn't religion, the freedom of religion, our believing and trusting in God, proving and living a life worthy of Him? It is not a church or a set of rules. Isn't demoracy and liberty our believing in it, proving it with our thoughts and actions? It is not a thing called government or political party.

Whether it be faith, democracy, freedom, liberty, peace, or any other set of words rubbed smooth with much tongue service—words which we throw about like so many pebbles—they are still merely we the people. And such greatness as may accrue to the world will come from only the people. And proving these things over and over again, and yet once again, and holding fast, and binding to us all those things which are fine and noble, that too is our job. Not the job of the government, of the church, of the United Nations, or any other institution. It is up to us, as individuals, to prove, to reaffirm, to protect, and also to go forth and tell all the world.

Too often we forget the individual, thinking we are but idle dust motes drifting aimlessly in a black vastness. We truly are motes, if we think we are! Yet, the Divine hand touched us all. A flame of greatness burns within each of us; it is but for us to prove it. Too often we cover this divine spark under shabby thoughts, half-hearted attempts, small fits and starts, and ignoble purposes. Too often we aspire to material gains, tossing aside deeper spiritual values, handling greatness like a pumpkin after Halloween. This is neither proving ourselves and our beliefs, nor holding fast to that which is good.

Are we going to prove our belief during the new year? Fight for it? Uphold righteousness? Be worthy of the dignity of man?

Christmas is generally such a happy time for the majority of people because each person feels a little closer to his Creator, feels the warmth of the Divine hand which guides. Each person is a little more anxious to prove these things and hold fast, if but for the brief life of the candle, these things which are good!

Prove all things—the love we bear our neighbors, the love we bear one another. Are we not of the same family? And if we prove these things at Christmas time, can we not prove them throughout the year? Let us hold fast to this—hold desperately fast to our God, our liberty, our democracy and above all—our dignity as men.

From the board of directors, the president, and the entire staff of the Hitchcock organization, may we wish you a truly happy Christmas and a new year filled with all the good things of life.

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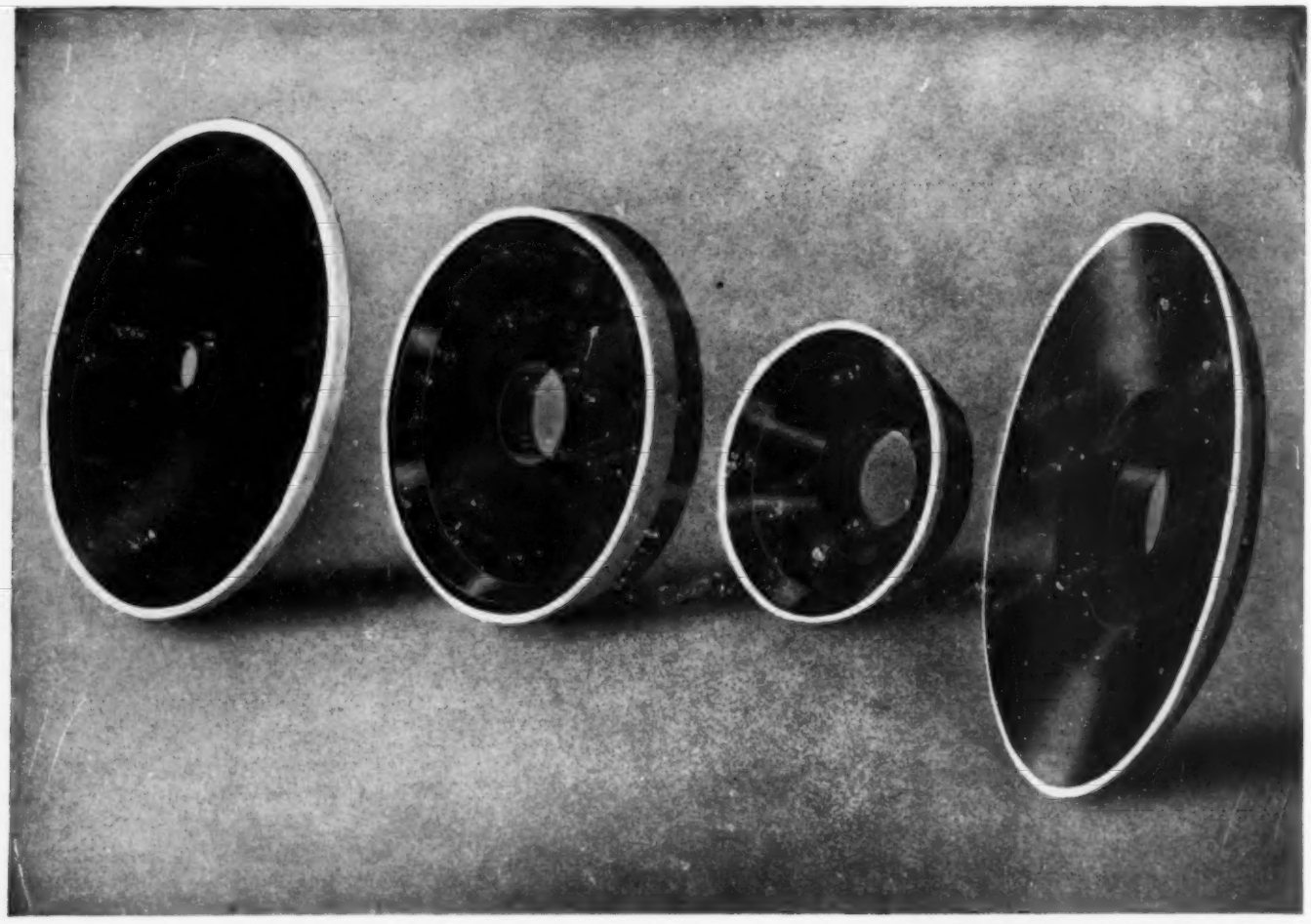

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Abrasive Engineer's Corner

ARTHUR RAKESTRAW • Contributing Editor

Grinding Internal Threads in Bores 1" I.D. and Smaller

• I would appreciate your suggestions for methods of internal thread grinding in bores 1" I. D. and smaller.—F. R M., Cicero, Illinois.

Some additional data to the type or types of thread grinder now in use in your plant, together with a more detailed description of your present difficulties, would have helped greatly in providing a pertinent answer to your question.

From my experience in grinding threads in small bores, it looks as though your problem has to do with the diamond truing of these very small wheels, because of the interference of the grinding wheel quill and the mounting flanges. The short wheel life of wheels mounted in this fashion may also be a difficulty.

If this is the case, I recall having solved a similar one in a plant producing steel molds for plastic pen and pencil bodies. The bore in the threaded end of the mold was approximately ⅜" in diameter.

For this I was able to obtain small ½" x ⅛" thread grinding wheels mounted on ⅛" diameter mandrels. The customer re-designed the thread grinding quill to accommodate a collet chuck for the purpose of holding the mounted wheel mandrel.

The permissible overhang of the wheel permitted easy diamond truing of the wheel face and clearance for grinding the thread to the required depth in the bore.

It is quite possible that the mounted wheel mandrels could be threaded so that the wheels can be assembled in the threaded mounting screw hole in the end of the quill, thereby eliminating the objectionable present wheel mounting.

It is of course imperative that you follow the Safety Code with respect to the operation of mounted wheels, so that the overhang—the extension of the wheel beyond the mounting—does not exceed the recommended length for the particular size of wheel and the operating speed.

THE CORNER is a good place to share your problems, comments, and experience in abrasives and their uses. Send your questions or contributions to: A. S. Rakestraw, GRINDING and FINISHING, Wheaton, Ill.

Form Dressing of Diamond Wheels

• What suggestions have you concerning form dressing of diamond wheels? —H. B., New York City, N.Y.

I assume that the problem presented here has to do with the re-dressing, for corrections in form wear, of a formed diamond wheel, rather than dressing a new form on a straight diamond wheel.

Inasmuch as there is no indication as to the complexity of the form, it is impossible to present more than a generalized answer.

Some simple forms can be touched up with a round fine-grit silicon carbide dressing stick, by rolling the stick against the high sections.

Some users of diamond wheels correct worn forms by using a brake-controlled diamond wheel dresser. The required face form is either diamond or crush-dressed on the silicon carbide dressing wheel, then applied to the diamond wheel face.

GRINDING and FINISHING

***"Must* you apply that grinding fluid in such a fine, smoggy mist?"**

I understand that many plants have discarded the formed diamond wheel and replaced the method with optical grinders using a very thin (1/32") diamond wheel. The required tool form is outlined on a transparent screen, magnified many times. By use of an optical lens the operator is able to position the thin diamond wheel so that the form can be reproduced on the tool.

Wide Belt Grinding of Stainless Steel

• What would you recommend for wide belt (36" and 48") surface grinding of stainless steel sheets to a thickness tolerance of .000" —.002". Sheet thickness ranges from .010" to .100".—E. B., Los Angeles, Calif.

With the very limited information you have provided it would be extremely difficult for me to make any helpful suggestions.

The abrasive belt is only one of a number of important items, all of which must be in proper relation to make up a satisfactory application.

The type of abrasive would undoubtedly be aluminum oxide, and the bond, perferably resin. Grain size would depend on many factors such as the quality of finish desired and the amount of stock to be removed to arrive at the specified limits.

A satisfactory answer to a question like this requires, for instance, a complete knowledge of the kind of equipment—make and size of machine; type of contact roll—rubber or steel; type of back-up roll; speed of belt. If the contact roll is rubber, it would be helpful to know the durometer hardness, type of serrations, width and depth of grooves.

It should not be too difficult to grind stainless steel sheet to the required limits, providing your equipment is adequate.

In other words, the more any abrasive engineer knows about a particular application, the better he is able to make worth while recommendations as to abrasives to be used. • • •

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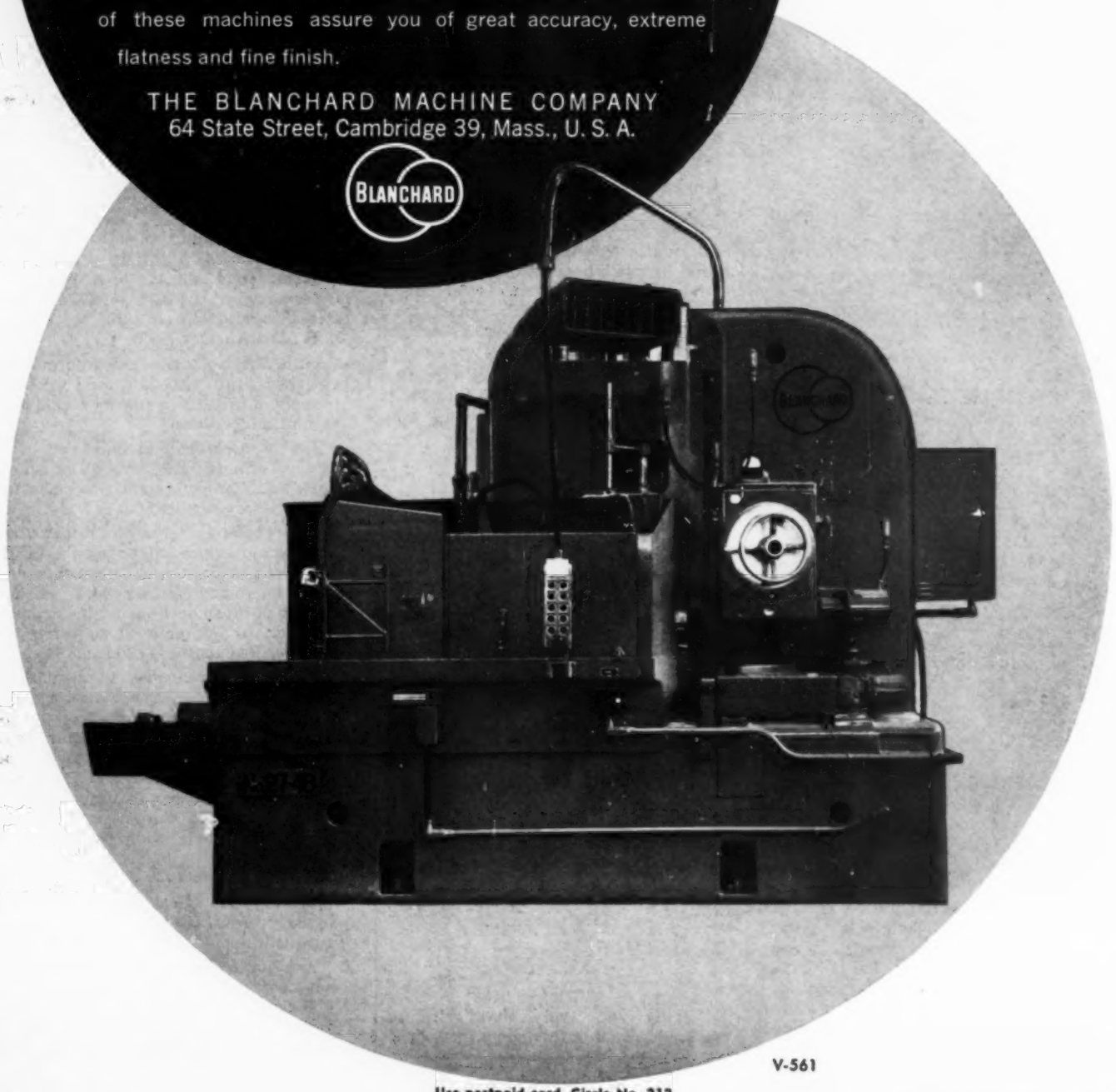

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American Society for Abrasives

Schofield, AIL, Speaks in Connecticut

R. B. Schofield, Airborne Instrument Laboratories, Deer Park, Long Island, N.Y., discussed the Inchworm motor with the Connecticut chapter at their meeting on October 24. The motor is a linear actuator used for automatic size control to very close tolerances on thrufeed centerless grinders.

Sixty-four members and guests attended the meeting, held at Sun Valley Acres, Meriden, Connecticut.

New Jersey Discusses Coolants

"The Role of Coolants in Machining of Metals" was the subject of a talk by **Clyde A. Sluhan,** president of Master Chemical Corporation, Toledo, Ohio, at the New Jersey chapter's meeting at the Log Cabin, Clark, N.J., on October 19. Forty members and guests participated in the discussion.

In his slide-illustrated talk, Sluhan emphasized that grinding evolves around the three factors of unit pressure, time, and temperature.

Western Mass. Talks Millionths

Dino J. Emanuelli, supervisor of special tap engineering with Greenfield Tap & Die, explained the fundamentals of precision dimensioning and space age requirements for measurements in millionths for the Western Massachusetts chapter in their meeting on October 17 at The Gables, South Deerfield.

With 30 members and guests, this was reported as "one of the best meetings we have ever had."

Two Men Present Surface Grinding for Hudson-Mohawk

Peter Van Ekelenberg, Mattison Machine Works, and **Charles Johnson,** Cinrock Machinery, showed movies to spark a discussion of general and special purpose Mattison grinders for Hudson-Mohawk's get-together October 3, at Cross-Roads Inn, Lathams, New York.

Snagging Concerns Reading

Richard Junod, Pennsylvania representative for The Carborundum Company, Niagara Falls, New York, used a movie to reinforce his presentation of "Methods of Snagging" at the late September meeting of the Reading chapter.

Recently-elected officers of the New Jersey chapter, above, are (l. to r.): William Deike, treasurer; William Wilkins, president; William J. Yurecko, vice president; and John A. Wilkins, secretary.

Long Island—Two Meetings: Carbides; New Fabric Wheels

Long Island's fall program got off to a good start with well-attended meetings in both September and October.

At the first, the speaker was **John C. McGreivey,** Behr-Manning Company, Troy, New York, who introduced to the group a new abrasive fabric wheel designed for wet or dry final finishing on metal, rubber, or plastic. Aiding in the presentation were a movie and charts.

The October speaker was **Jerry Scheyer,** plant engineer, Adamas Carbide Corp., Kenilworth, New Jersey, on "Theory and Practices for Grinding Carbides."

Unveil Space Age Challenges to Grinding and Finishing

Richard H. Merritt, consulting engineer on grinding wheels for the Abrasive Division, Norton Company, Worcester, Mass., presented to the Cleveland chapter's October meeting the challenges facing the abrasive industry. Greater precision, increased feeds and speeds, different coolants, new metals and alloys, and similar conditions are only a few of these factors.

Eighty-five members and guests gathered at the Cleveland Engineering & Scientific Center for the talk.

Chicago Hears Safety Talk in Colonial Atmosphere

Fifty members and guests of the Chicago chapter enjoyed the colonial atmosphere and a huge log fire during their November meeting at The Old Spinning Wheel. They listened to R. E. Whiteside, accident prevention manager for Employers Mutual of Wausau, discussing the effects of accidents on insurance costs.

Special emphasis was laid on the prevention and seriousness of grinding wheel accidents. Mr. Whiteside called attention to the ASA Safety Code, which he called "the fundamental reference in grinding wheel use."

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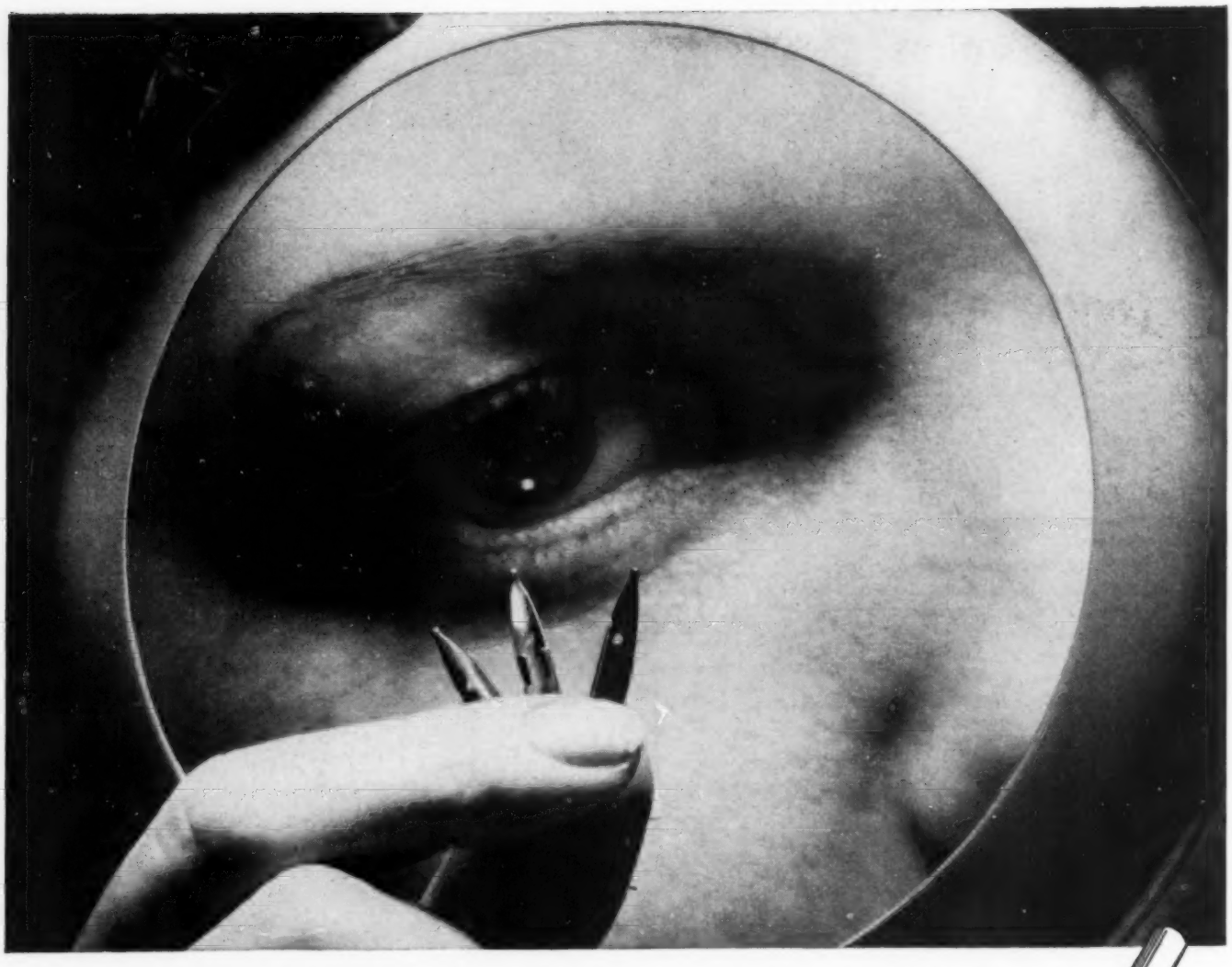


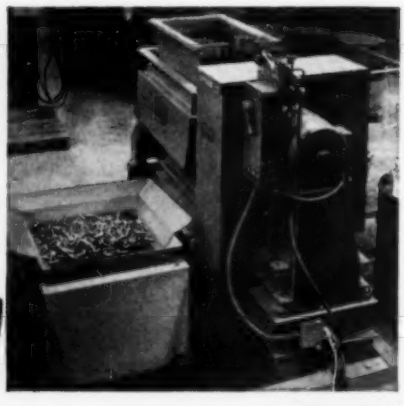
ALMCO Precision Finishing Gets to the Point.

At the Parker Pen plant in Janesville, Wisconsin, nibs for the famous Parker Pen are carefully examined (as shown). The writing surface must be flawlessly deburred and polished before being attached to the pen barrel in final assembly.

Almco precision finishing equipment does the job quickly and efficiently! Both conventional units and the new Vibratory machines are used at Parker to help make fountain pens that resist pressure, friction and abuse.

Almco's modern machines and methods—the Supersheen System—can help you achieve fine finishing results too. At Almco you receive trained counsel for your finishing problems . . . free sample processing in Almco's modern labs . . . skilled guidance in selecting the proper standard or custom-designed Almco machines and methods. Write today on your letterhead asking for an Almco sales engineer to call. Or send parts direct to Almco's lab with specs required.

Parker Pen barrels are Almco precision finished too! Almco Vibratory units can do the work 100 times faster than conventional finishing machines.



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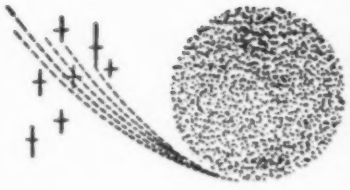


Ideas from the Shop

Magnetic Chuck Parallels for Multiple Work-Pieces

By M. W. Loftus

• For some classes of work, such as the part shown, it is necessary to use parallels to support the work-piece on the magnetic chuck for grinding.

If the full surface of the chuck is to be used, and particularly if more than one piece is to be ground at one time, commercial parallels for this purpose are often too short.

Using several of them is bothersome, and their cost is more than that of the parallels shown.

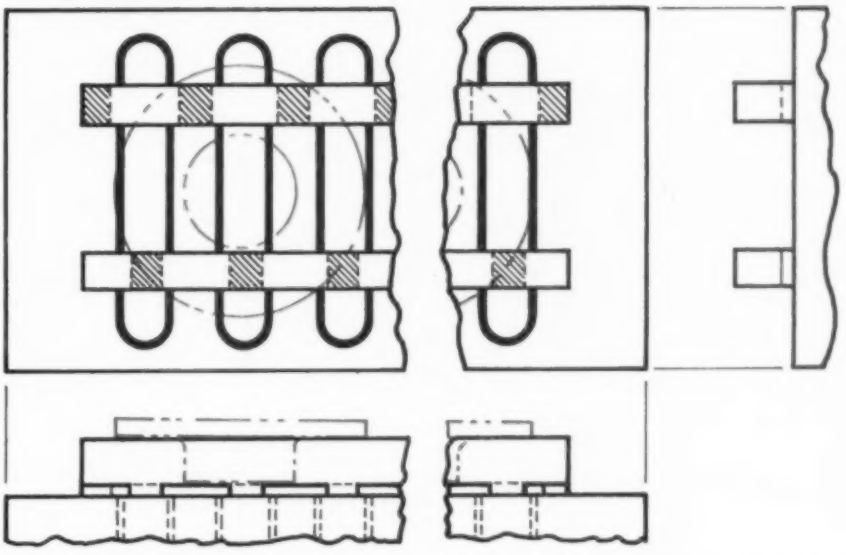
Ordinary parallels, of course, won't do. The parallels will be held, but the work won't be.

The parallels illustrated were made to use the full effective working surface of the chuck. The front one is notched out, leaving surfaces that rest on the poles.

The rear one is notched so that the remaining surfaces will rest between the poles. In the plan view, the contact surfaces are shown shaded.

The magnetic lines of force flow from a pole through a parallel to the work, then through it to the other parallel, and back to the work.

These parallels are perhaps most useful when more than one part is being ground, as they can be made as long as the chuck will permit.



Sketch of parallels holding workpieces on magnetic chuck. Shaded areas indicate "feet" resting on the chuck—front ones on the poles; rear, between.

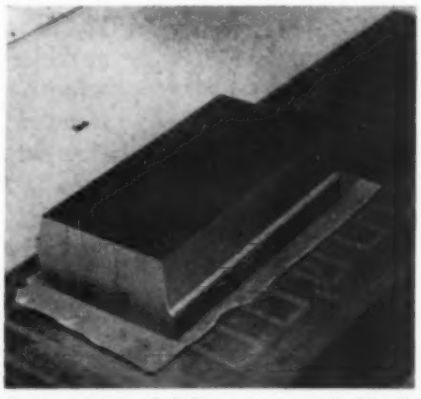
Felt Cushions Rough Work for Surface Grinding

By H. J. Gerber

Often it is necessary to perform surface grinding operations on castings, forgings, and rough, hot rolled steel bar stock. To seat the work securely, without rocking, we follow the practice of bedding into a thin piece of felt placed on the magnetic chuck.

The felt provides a cushioning effect which equalizes the rough surface. Of course, after the first operation a truly flat surface is available and the work can then be located to this surface without the use of the felt.

On heavy work of considerable thickness this felt separator does not seem to diminish the holding power of the chuck to any great extent. However, care must be taken if the work is thin because, in cases of this kind, there is a noticeable loss in holding power.



Thin piece of felt seats rough block on magnetic chuck.

More Tips From Clover

A honing machine may be used to lap out the scratches caused by honing a cylinder or bearing. Substitute blocks of hardwood for honing stones and use Clover Lapping and Grinding Compound. The machine must be operated slowly for best finish, and very little stock should be removed.

When the particular file you need is worn so much as to be ineffective on metal, apply Clover Compound to the face of the file and use it as before.

• • •

(Courtesy Clover Manufacturing Co.)

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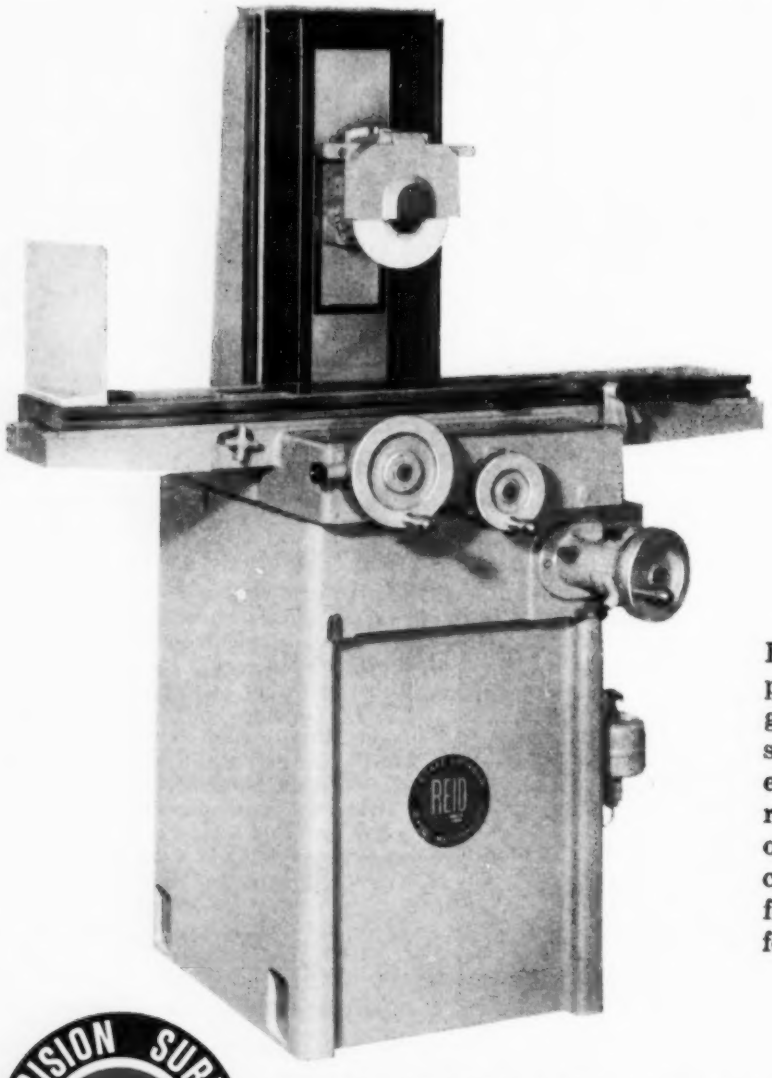

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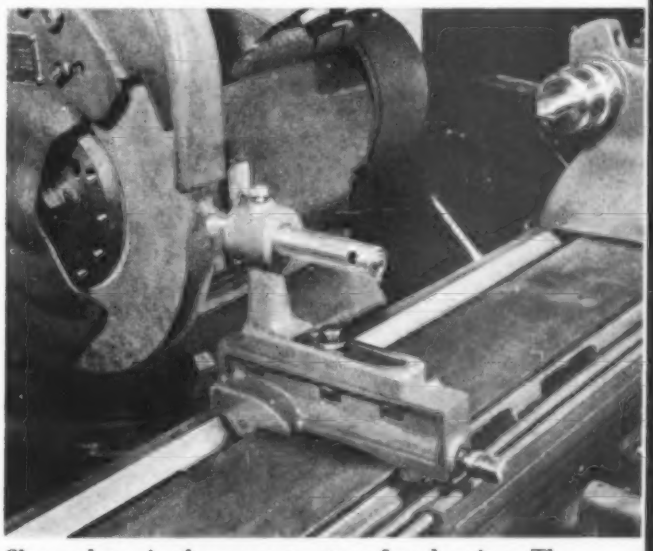
Design for Grinding

Are you losing on diamond dressing?



Shown here is the correct setup for dressing. The tool is being presented to the wheel at the proper drag angle. Photos courtesy of Maurice S. Dessau Co., Inc.

By CHRISTOPHER H. HILL, SR.

● One of the most costly wastes in both dollars and production is the misuse of the diamond in dressing and truing grinding wheels. The major areas of misuse are lack of coolant, turning coolant on hot diamond, not turning the diamond, improper drag angle and trying to cut cost by purchasing cheap diamonds. Comparative records and judicious buying provide additional areas of savings for diamond users.

Many operators explain away the sufficient use of coolant by saying it would splash all over them, the machine and work area. This splashing can be easily remedied. It is caused by the generation of air by the grinding wheel rotating at high speed, the air turbulence carrying the coolant away from the grinding wheel area. The first step to prevent splashing is to adjust the wheel guard until it just clears the grinding wheel. If this does not stop all the splashing, wind deflectors can be made of sheet metal in the form of an angle and secured to the inside of the wheel guard by machine screws. They should slant backward and downward so that the force of the air will be deflected toward the rear of the wheel guard. When installing the deflectors the measurements should be made carefully so that they just touch the side of the wheel. Excess metal on the edge of the deflector will be ground off, giving an almost air tight fit.

The proper technique for coolant application, should be to bring the diamond up to the grinding wheel until it merely touches the wheel and at that moment the grinding fluid should be turned on so that the bulk of the coolant is directed exactly at the point of contact of the diamond and wheel. There should be a generous supply of coolant so that the full face of the wheel is flooded. Some operators have fed the diamond into the grinding wheel to a depth of .004" to .006", then turn the coolant on a red hot diamond. This sudden change of temperature generally cracks the diamond and renders it useless.

Another costly fault occurs when the diamond is never or not frequently turned in the diamond tool holder. This eventually wears a large flat spot on the diamond which causes excessive heat and cracking. A dull diamond does not true a grinding wheel face correctly as it leaves the face of the wheel too smooth when it should be sharp.

continued

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Design For Grinding continued

Above are shown some of the many types and sizes of diamonds used for dressing and truing tools.

The loosening of a screw, and turning of the diamond takes only five or ten seconds. A sharp diamond keeps the pores of the wheel open, the face sharp and efficient.

Diamond tool holders that are an integral part of the grinding machine, or that are held on a grinding machine by clamping or magnetic force, are designed by the grinding machine manufacturer to present the diamond to the face of the grinding wheel at the proper angle. The "drag angle," with the exception of internal grinding machines, should be from 10° to 15° below a horizontal line through the center of the wheel where it bisects the vertical center line.

One of the best ways to ascertain your diamond costs is to have a small card printed with a space for the date when the diamond was taken out of the tool crib and another space for when it was turned in. These spaces should be filled in by the tool crib attendant in ink or with a stamp. Then there should be a space where the operator can mark an X or a check each time he trues the wheel. This card can be kept in a convenient space by the operator and turned in with the diamond when it needs resetting, thus providing a record of the diamond and the operator using it. The foreman and/or the lead man of the department should be held responsible for carrying out this project. Each operator should have his own diamond and be held responsible for it.

Cheap diamonds are the most expensive in the end. Always deal with a reliable, well-established firm that will stand back of their product, promises and will render help when needed. It takes an expert to know the quality of a diamond.

Always have your diamonds reset by the company that originally set it. They have the equipment and knowhow to do this scientifically correct. The eventual total cost will be less. • • •

Capsule Guide To Lapping

Lapping is an abrading process for refining the surface finish and geometrical accuracy of flat, cylindrical, and spherical surfaces. It removes surface waves, tool marks, grinding fuzz, slight distortions, and like minor defects left by a preceding operation.

Much lapping is done with a loose abrasive in a vehicle which rolls between the work and the lap, which in such a case is a softer material, usually cast iron.

In this form of lapping the work and lap are not positively driven, but are rather guided in contact with each other so that fresh points of contact are made by constantly changing relative movement.*

The Basic Rules

1. Abrasive grain should be at least as hard as material to be lapped.
2. The lap itself should be softer than the work.
3. The vehicle should be heat resistant and viscous enough to keep grain in suspension.
4. Increasing pressure increases speed of cut, but too much pressure will score the work.
5. Increasing lapping speed reduces speed of cut.
6. Lapping soft metals calls for softer laps and, sometimes, special compounds.
7. Quality of finish depends upon all elements of the process, uniformity of work, the grain, the vehicle and the lap.
8. Fine flat lapping and cylindrical lapping are best done on plain laps. Grooved laps are best for fast, coarse work or for flat pieces with slots or cut-out areas.
9. Generally speaking, the hardest materials are easily lapped. Softer materials may have to be burnished or buffed after lapping to size.

. . . And the Cautions

1. Keep compound covered when not in use. Contaminated compounds can ruin the work.
2. A mirror surface does not guarantee smoothness or accuracy—a mat or dull surface may be just as accurate.
3. A uniform gray finish does not necessarily mean errors in size or surface have been corrected.
4. Do not mix various grits or grades of compound. Uniformity of grain is one of the essentials of top-quality compounds.
5. Always dress the lap with the same compound that is to be used for the work.

(Courtesy Clover Manufacturing Company)

*THE GRINDING WHEEL, by Kenneth B. Lewis, rev. by W. F. Schleicher. The Grinding Wheel Institute, 1959. Page 343.

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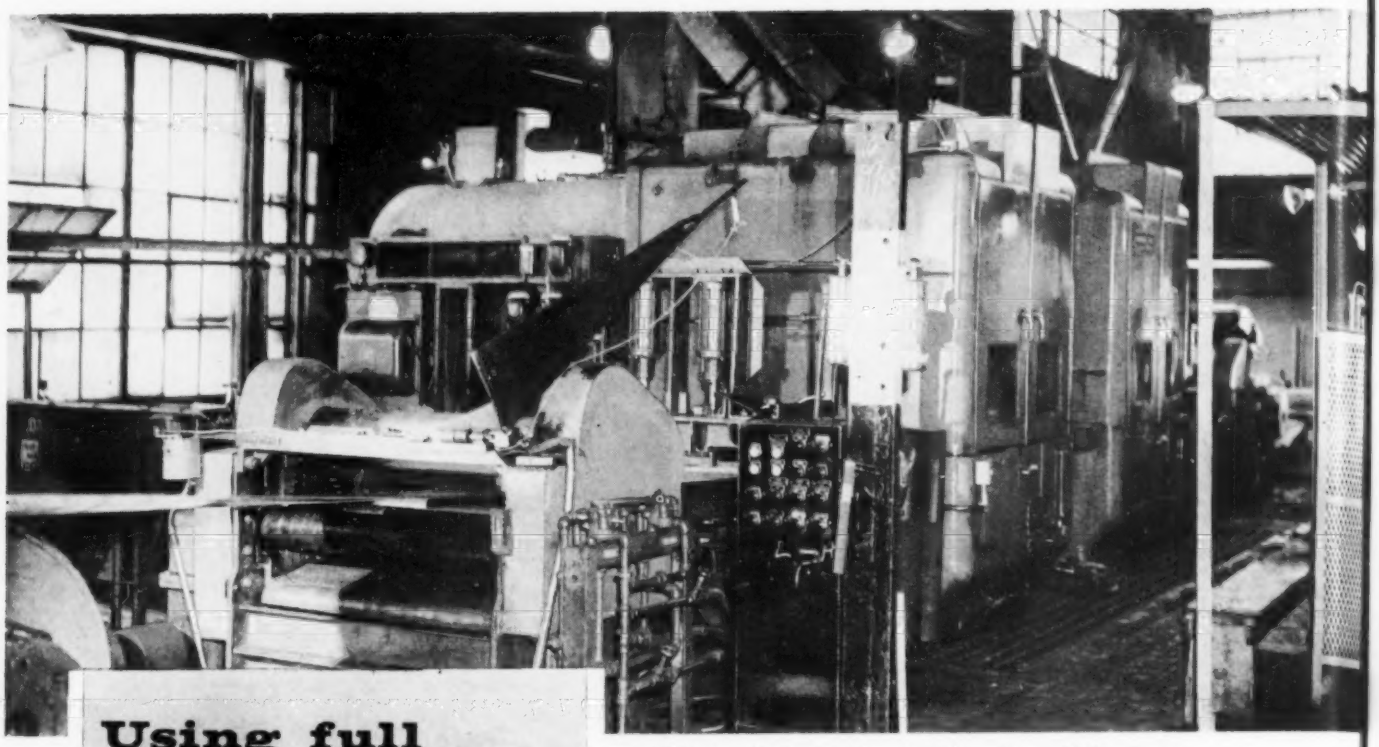

This is the type of operation for which power programming has the most immediate application. With a uniform surface, manual control is possible. Belt costs go down about one-third.

Using full grinding power increases belt efficiency ...

"Power programming, a new method for gradually increasing the power as the belt wears on a wide-sheet grinder, brings reduced abrasive costs, more consistent dimensions and surface finish, better use of power, and increased machine output, without an increase in capital investment."

By H. L. WEISBECKER
Minnesota Mining and Manufacturing Company
in an interview with
Dick McKee

Dr. H. L. Weisbecker, supervisor of physical studies, Abrasive Laboratory, Coated Abrasive and Related Products Division, joined 3M in 1955 after becoming a Doctor of Physical Chemistry at the University of Notre Dame, South Bend, Indiana. A native of Pittsburgh, Pennsylvania, he earned his Bachelor of Science degree in chemistry at Georgetown University, Washington, D.C. Dr. Weisbecker has been in his present position one and one-half years. While at 3M he has concentrated on work in the basic mechanism of the grinding of coated abrasives.

● In a few words, Dr. Weisbecker, how would you describe "power programming" for abrasive belt grinders?

A. "Power programming" is a planned method for increasing the horsepower used on an abrasive belt grinder as the belt wears, rather than maintaining it at the same level throughout the life of the belt, as is usually the case now.

Q. And what, briefly, are the differences between power programming and conventional methods?

A. It helps if you can picture three factors that can vary during the life of the belt—power, rate of cut, and quality of surface finish.

A new belt with sharp abrasive grains removes considerable stock from the work. As it wears, the rate of cut is reduced, the scratches become shallower and the quality of finish improves. This, of course, is with constant power. Typical curves are shown in figures 1 and 2.

You can visualize the conventional method as a graph (see figure 3A) with two lines: a descending line for rate of cut and a level line for power.

However, if you tilt the power line upward (see figure 3B) the rate of cut tends to level off, since there is less pressure on the belt at the beginning, when the grains are sharp, and more after the grains have become dulled.

Increasing the pressure on the belt by adjusting the billy roll, I should have added, is the most feasible method of increasing the power input.

At the same time, surface finish becomes more uniform, since the sharp grains are not forced into the work at the beginning.

Q. And can you sum up the results of your investigations in power programming?

A. We estimate that adoption of a power programming system would reduce abrasive belt costs by about one third. Also, for the first time it would make it possible to specify the number of sheets to be run per belt and the amount of stock removal per pass. More consistent dimensions and surface finish indicate a better quality product than has been possible before.

Other advantages would include better utilization of the total power of the grinder, and for practical purposes, an increase in machine capacity as the necessity for re-cycling sheets declines. Power programming increases the possibilities for getting the work right the first time through.

Q. We can go into that in more detail later. What capital investment does it require, and about how long should it take to pay for itself?

A. Power programming can be adapted to any wide-sheet grinding and polishing operation at a minimum of cost. It can be made effective immediately on a manual basis, with little if any change in equipment. Some machine tool manufacturers are designing automatic program control equipment which can be adapted to most sheet grinders, automatic or otherwise.

Lubrication systems now in use should be adequate for test programming, but it ought to be to the advantage of the finisher to test other types of lubricants and methods of application.

Machine adaptations would hardly fall into the category of capital expenditures. The system should pay for itself right from the beginning.

Q. How does a plant go about setting up a power programming system?

A. The first step is to determine the rate of cut to be maintained. This will most likely be a rate that occurs early in the life of the belt. Factors to be considered in this determination are the adequacy of the lubricant to control burning under the required pressures and rate of cut; and the maximum scratch depth that is tolerable at that particular stage in the finishing operation.

The second step is to establish with an ammeter the initial power reading that will yield this rate, and the rate of increase of load required to maintain this rate. It is desirable to develop power programming specifying a certain initial amperage reading and a fixed rate of amperage increase as a function of grinding time or number of passes. Such a power schedule is shown in Table A.

continued

Figure 1

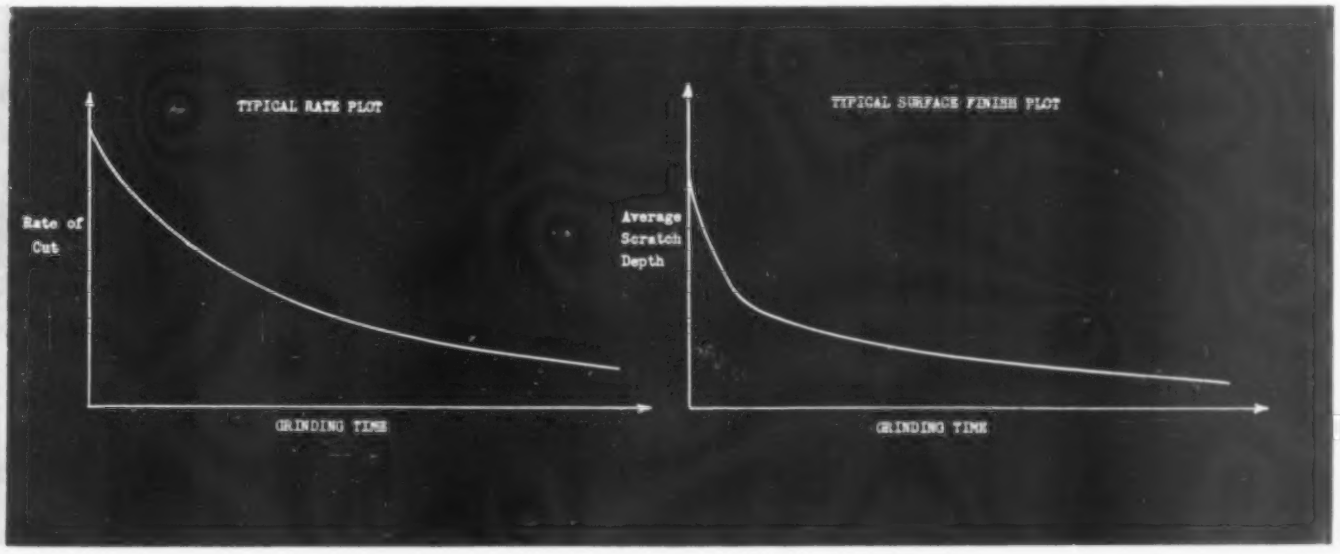

Figure 2

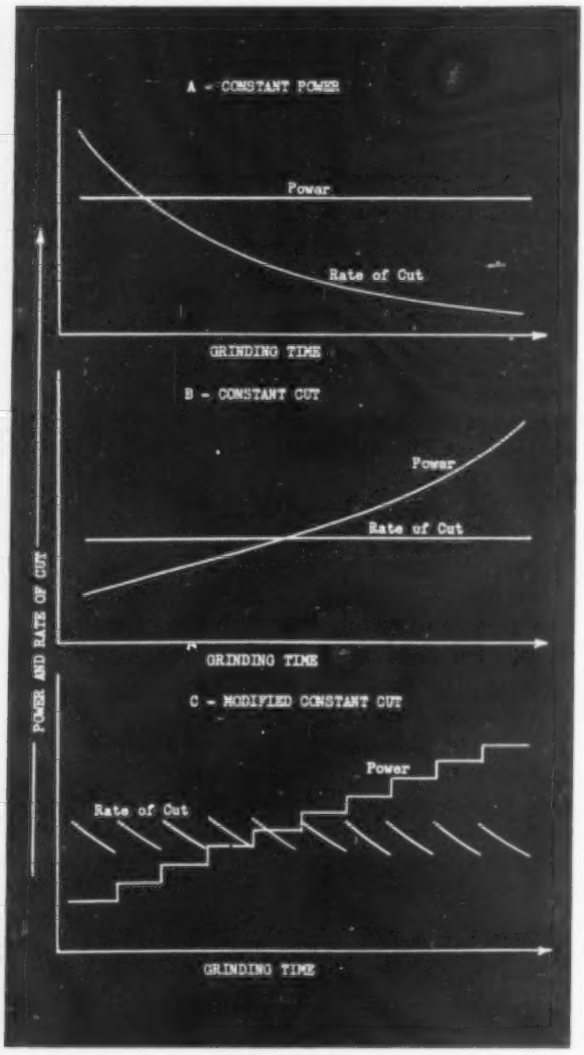

Figure 3

After the original cut-per-pass has been determined, and the power requirements for this amount of cut are known, the power increase is calculated. If, for example, the initial amperage reading yields a cut of four ounces per pass, the amperage should be increased at the first indication of a drop in rate to three ounces.

In laboratory and field tests the amperage was increased by aperture adjustments in 25-ampere increments.

Q. Does power programming require extensive alterations to the grinders?

A. Generally speaking, no. If manual adjustment of the pressure is adequate, then the alterations are minor at the most and can be initiated immediately. This stepped adjustment results in zig-zag pattern of stock removal and finish, (see figure 3C) which can be held within designated limits.

Providing for uniform and automatic increase in pressure, which produces the most uniform rate of cut and quality of finish, is of course more expensive. Which alternative is chosen depends on a number of factors in addition to the extent and cost of machine alterations.

Q. How do you determine the effective life of a belt?

A. The end-point is reached when it is no longer possible to maintain a fixed rate of cut. In Table A you will note a remark about making more than 85 passes "at discretion" on the 75 hp machine, or more than 130 on the 100 hp machine, but our experience indicates that the rate of cut would suffer if this were done.

This point of establishing a minimum and in effect a maximum number of passes per belt is one of the strongest arguments for power programming. Such a determination is difficult under a conventional procedure, where the number of passes may not even be known, and where the decision to change belts is left to the operator.

Q. What is the common practice for attaining satisfactory quality and for replacing belts?

A. The usual practice is to grind to visual inspection. Sheets or coils are re-cycled until an inspector passes them.

Similarly, belts are commonly replaced when in the operator's or foreman's judgment they are no longer satisfactory.

Q. Isn't this a rather inefficient procedure?

A. It certainly has such possibilities. For instance, an operator could discard a belt that still had usable life, or more likely, would use a belt far beyond its efficient life.

It can also result in the removal of more stock than necessary. Any sheet or coil ground with a new belt might have considerable stock removed, with poor surface finish. Re-cycling such material removes more stock, accentuating the variation.

On one 20-sheet test run on titanium, the first five passes removed 3½ to 5 ounces of stock; the last five, only 1 to 3 ounces. Yet these sheets were subsequently treated as equal.

With such a procedure there is no practical way of determining how many of the passes for a given lot are really necessary.

Q. Earlier we mentioned some of the advantages of power programming. Are there more?

A. Certainly. More efficient use is made of the available horsepower of the grinding machine. Instead of grinding at a constant power level that is often only 30% - 50% of the capacity of a modern grinder, the new method can use graduated power inputs up to the full power of the unit. Thus it produces more grinding and finishing per hour from the same equipment, with lower abrasive costs and a better finish. This is essentially the same as increasing capacity without adding to equipment or to the floor space used.

Still another advantage of programming is that it utilizes the initial sharpness of the belt—something that has generally been wasted. With constant power, scratch depth with a new belt is often great enough to spoil the surface finish and make re-cycling necessary.

Q. Awhile back you spoke of increasing the pressure on the belt. How much of a possibility exists for tearing a belt?

A. I suppose there is always a possibility, but our research indicates that it is remote. Modern coated abrasive belts can stand at least 100 lb. pull per inch of belt width, roughly equivalent to a power consumption of 10 hp per inch of width at a belt speed of 3000 sfpm. I would say that it is almost impossible to apply too much horsepower per inch of belt width, at least with present-day grinders.

Q. In general, in what kind of plants were the tests conducted, and how extensive were they?

A. Tests were conducted on stainless steel and titanium sheet grinding. We selected stainless because it is the largest single application for wide belt grinding, and titanium because it offers so many problems.

These were also applications where both stock removal and finish are important, and where stock removal is measurable. Polishing is of course a wide belt application, but stock removal is such a minor factor that it would show very little, if any, difference between conventional scheduling and power programming.

In general, the extent of a test depends on specific quality and production requirements.

In one case, the pressing need was for an increased rate of production. The grinding-polishing operation had become a bottle neck. Power programming was utilized to produce a four-fold increase in the processing rate.

In a second case, abrasive costs were emphasized and the power program was adapted to allow full utilization of the available power capacity at an equivalent production rate. The stock removal per belt was increased 47%, indicating an abrasive cost reduction of 32%.

Q. Can you cite some specific examples of economies effected by the adoption of power programming, to substantiate the approximate one-third reduction in abrasive belt costs?

A. In an in-plant test we compared performance of grade 80 Tri-M-Ite resin bond in grinding a titanium alloy with and without power programming. Using the identical belts with application of tripotassium phosphate solution to the sheet, we found that power programming affected a 42% reduction in the cost required to grind one thousandth of an inch from the sheet.

POWER SCHEDULE FOR GRINDING C110M SHEETS ON 75 HP AND 100 HP MATTISON GRINDERS

Passes	Amperage
1-10	100
11-25	125
26-40	150
41-55	175
56-70	200
71-85	225
Make further passes at discretion on the 75 hp machine	
86-100	250
101-115	275
116-130	300
Make further passes at discretion on the 100 hp machine	

This schedule should be used as a suggested norm. A minimum of 70 passes should be obtained on the 75 hp machine, and 100 passes on the 100 hp machine.

Table A

In the first test, standard practice was used and all power adjustments were made at the operator's discretion. In 30 passes, 3.25 lbs. of metal were removed. With the power programmed such that the amperage reading was increased by 25 every sixth pass, 4.63 lbs. of titanium were removed in 30 passes.

In a similar test on a different titanium alloy, three grade 80 Tri-M-Ite Resinite paper belts were used to finish 23 sheets in a total of 92 passes. In standard practice four grade 80 Tri-M-Ite glue bond paper belts were used to finish 21 sheets in a total of 85 passes. In themselves, these figures indicate a cost reduction of 24%, although a resin adhesive was required with the water based phosphate lubricant. A paper belt could be used as the solution was applied to the sheet in reduced volumes.

Further, in this test, weight loss figures showed that the power programmed Resinite paper belts had removed 45% more metal per sheet, cutting 1.51 thousandths of an inch per sheet compared to the 9 thousandths depth of cut obtained with glue bonded paper belts. The actual cost to grind a thousandth of an inch from a sheet was reduced by 49%.

Q. Then is power programming limited to a particular group or type of abrasive belt grinders?

A. As far as we can see, no. While the benefits might vary somewhat from what we found, it should be profitable, and could be applied, on any abrasive belt grinder, regardless of type, make or width of belt.

We feel that the most immediate applications are to wide belt grinding for two main reasons.

The power program for a uniform surface is relatively simple and manual control is possible. Although the system is potentially applicable to contoured surfaces, automatic control will undoubtedly be required.

The second reason for emphasizing wide belt grinding applications is that, in general, the full capacity of available grinders is not being used. Where this is true, power programming can provide increased life as well as superior control and quality.

Q. What is the effect on power programming of the type of abrasive in the belts? Of the metal in the sheets ground?

A. Neither one basically affects the principle of the system.

Of course, a waterproof belt must be used with a flood of water-based lubricants. Non-waterproof abrasive belts, such as Three-M-Ite resin bond cloth, may be used with an oil flood, or with any lubricant applied in reduced volumes.

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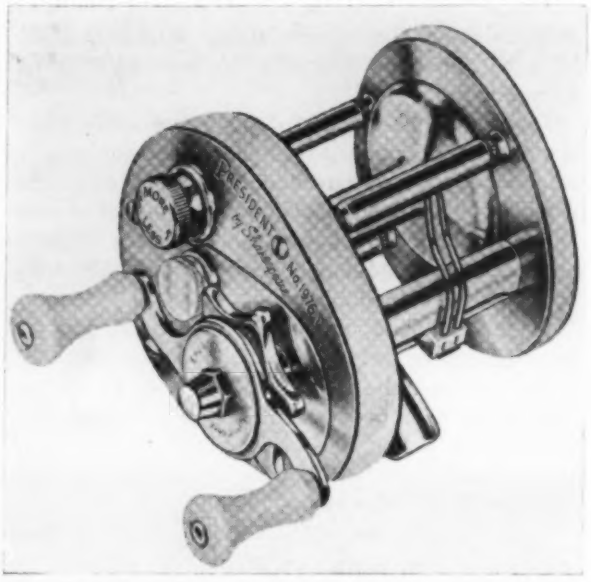
How planning built a modern, efficient barrel finishing department at Shakespeare

One of the finest barrel finishing departments in the country has been developed through careful planning and evaluation of each part. Shakespeare's manufacturing staff has covered each part to come up with the best quality at lowest cost by barrel finishing with some of the most modern equipment.

By M. M. PATTERSON
Managing Editor

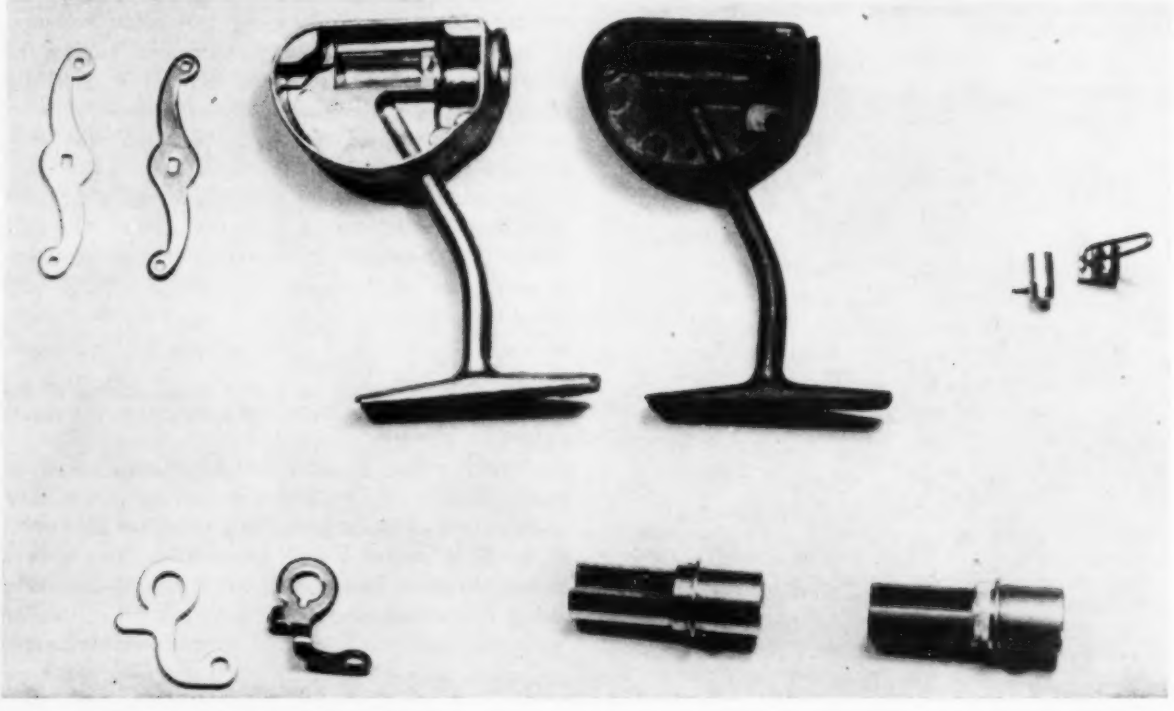
● The Shakespeare plant in Kalamazoo, Michigan has what is probably one of the finest finishing departments in the country. The development of this department has resulted from two basic requirements: the first is that in the production of the Shakespeare fishing reels, there are a great number of parts which obviously require mechanical finishing. The second requirement, and perhaps the most responsible for the development of this well-planned operation, is the careful engineering of processing by the manufacturing staff of Shakespeare.

The equipment in this extremely up-to-date finishing department consists of four Vibratrons, ten 2-compartment, 26½ cu ft capacity barrel finishing machines, two 2-compartment, 10 cu ft capacity barrels, four single compartment 18 cu ft



The President Reel shown above is typical of the craftsmanship of the Shakespeare manufacturing.

Typical examples of reel parts which are described in the article. Material ranges from aluminum die casting of frame (center), aluminum spool bearing (lower right), stainless steel bailwire mounting bracket (lower left), to machine brass carriage block (upper right) and brass crank plate (upper left). All finished parts are shown on the right of rough parts.



capacity machines and one 2-compartment 36 cu ft capacity barrel finishing machines all manufactured by Roto-Finish Company, Kalamazoo, Michigan. Equipment also includes two separators for separation of the media from the products. For the operation of the equipment in this department, Shakespeare employs three men and a foreman.

As each part is presented to the manufacturing group for processing, it is reviewed as an individual problem. Each part then is processed according to these requirements and from time to time this processing is re-evaluated.

There are seven areas of consideration which must be made for each part which is processed through this department. The first is the type of finish. If the part is to be plated, the finish required must be fine. If the part is to be painted, then the finish required is rougher, thereby providing for greater adherence of the paint to the material. The second area is burr or flash removal. Under this area, removal of parting lines, burring only, edge break only, and the amount of radius must be considered.

As stated above, each part must be considered under individual treatment and combination of these two points would require a balancing of the operations. A certain give and take must be made between these two requirements in order to obtain the best processing.

Other requirements which must be considered are the material, chip lodging, size of the parts, production requirements and separation of the parts from the abrasive.

As an example of the processing which is performed in this finishing department, let's first look at the crank plate which is so common with all fishing reels. This crank plate was formerly

Automatic separation on the Vibration machine is shown here. This has eliminated the handling of parts from the machine to the separators.

View of the main line of barrel finishing equipment in this very modern barrel finishing department. Equipment ranges from Roto-Finish two compartment, 36 cu. foot machines to single compartment 18 cu. foot machines and includes two Vibratrons.

ROTO PROCESS SHEET

PART NO. _____

PART NAME _____

OPERATION #	1-GRINDING	2-BRIGHT HONING	3-COLORING
MACHINE TYPE			
MACHINE SPEED			
WORK LOAD			
RUNNING TIME			
CHIP TYPE			
CHIP SIZE			
COMPOUND TYPE			
COMPOUND QUANTITY			

MISCELLANEOUS: _____

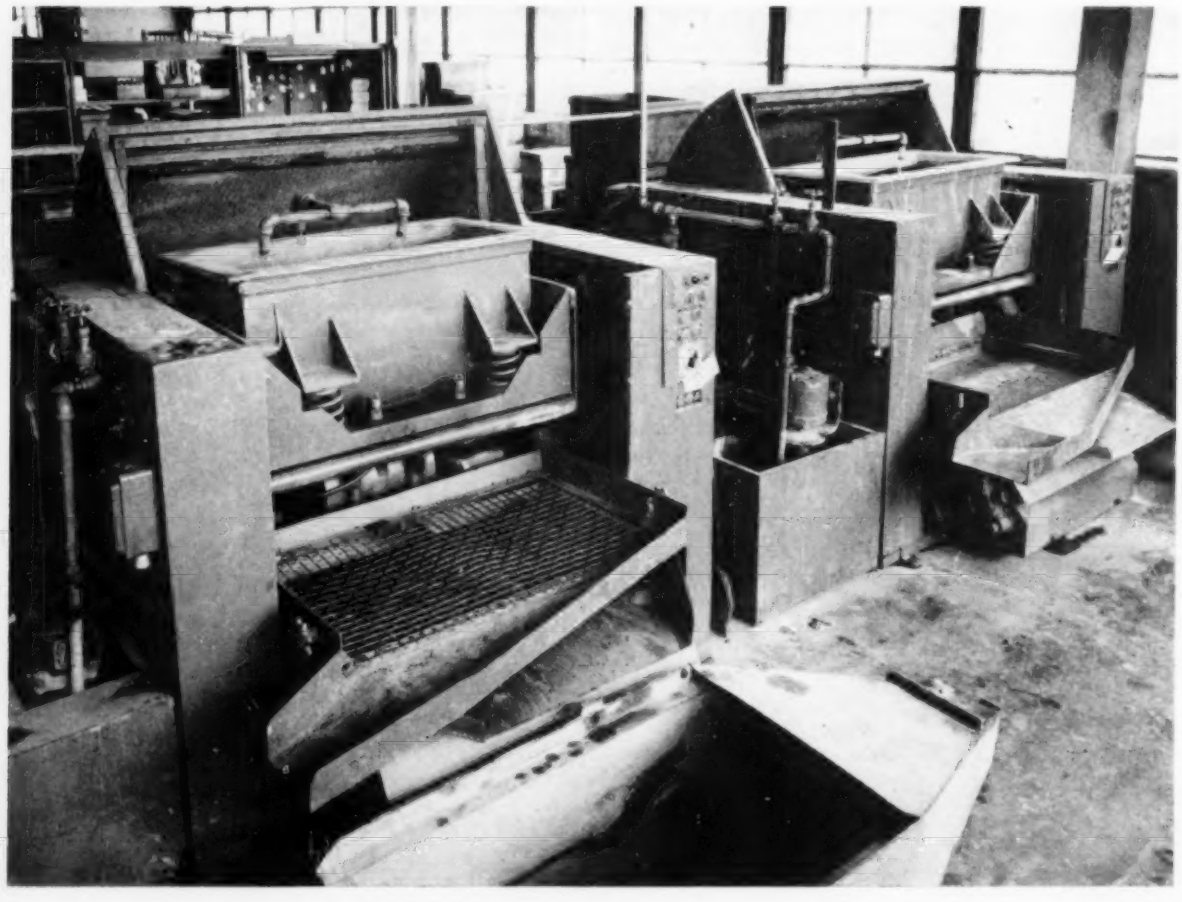
Processing form used by Shakespeare

mounted on an arbor and grease-polished to remove the die lines; it was then removed from the arbor and buffed on both sides individually. This production rate was 500 to 600 pieces for the grease-polishing and 125 pieces per hour for the buffing. Today, this part is de-greased and then processed through a Roto-Finishing operation prior to plating.

The first step is performed in one of the ten Roto-Finishing 27 cu ft two-compartment machines. The speed of this machine for the grinding operation is 30 rpm. The work load is 10,000 pieces running for 48 hours with a lime-stone No. 2 chip. The second operation described as bright honing is done in the same machine at 20 rpm, with the same load running for 4 hours using the same chip. However, between these two operations the machine is flushed out and the compound changed. This requires 20 minutes. Compound is changed every 12 hours simply because the action wears it out. Separation time between the bright honing and the third finishing operation, described as "coloring," is 5 minutes. This third operation is done in the single-compartment, 18 cu ft capacity Roto-Finishing machine at 20 rpm—5000 pieces per load-running for 30 minutes using steel balls 3/16" in diameter to provide the bright finish for plating.

The carriage block which is also a familiar part on finishing reels was formerly processed through a sanding disc operation in which the edges were polished at the rate of 500 pieces per hour. After assembly of the part—that is, the insertion of the wire in the block, the parts were hand buffed at the rate of 300 pieces per hour. This machined brass carriage block is now routed through the mechanical finishing department twice; the first time, to remove the cut-off burrs in order to locate for the drilling operation. This is again accomplished in the 27 cu ft two-compartment machine at a speed of 20 rpm, a load of 16,000 parts running for two hours in a lime-stone chip, size No. 2 or 3. Separation for this first operation is 10 minutes. The second operation, which is performed after

Two Vibratrons employed by Shakespeare to great advantage. These Roto-Finish machines have greatly increased the capacity of the department.



the wire assembly, is provided to remove drilling burrs and to finish the machine marks on the block itself. This operation, like the crank plate, is performed in three steps, the grinding, bright honing and coloring. For the first two, the machine is the same as for the first step running at 20 rpm, 16,000 parts per load, 5 hours for the grinding, two hours for the bright honing with lime stone chips of No. 2 or 3 size with separation time, 5 minutes. The third operation is again on the 18 cu ft single-compartment machine running at 20 rpm, 16,000 parts for 30 minutes using ⅛" diameter balls and again separation is 5 minutes.

Still another part is the stainless steel bailwire mounting bracket which passes through two mechanical finishing operations, the first two to remove the blanking burr from the radius and the die lines. This formerly was run in the 27 cu ft, two-compartment machine. Now it is being processed in the Vibration, running at 2,200 vibrations per minute. The load is 30,000 pieces, the same as the previous method. Running time has been reduced from 72 hours to 6 hours, and the Vibraton has produced results comparable or better than those performed in the other machine. The second finishing operation comes after a bending of the part and is performed for finish which must be a bright lustrous finish. This is performed on the 18 cu ft capacity single-compartment machine running at 17 rpm, the load being 10,000 pieces and time 2 hours in ⅛" diameter steel balls. Separation time for the first operation is 20 minutes and for the second, 5 minutes.

A fourth part, an aluminum spool bearing, is an example of the diversity of the material that can be processed. This part is processed in the Vibratron to remove a burr from the ID and a slight OD burr. It should be noted that this Vibratron operation removes the ID burr without lodging. The machine is run at 2,200 vibrations per minute, a work load of 4,000 pieces and a running time of 3 hours. Chip style is an AX 88 cylindrical preformed chip and the size is ½" dia. by ¾". This operation is prior to the bright dipping operation and is concluded with a separation time of 10 minutes.

The last example is also an aluminum part but presents a little different problem in that it is a frame with a large amount of flash to be removed. Because of this large flash, a floor belt sander is used to grease polish the heavy flash with a No. 80 grit belt. After this operation, the parts are loaded into a Roto-Finish Vibratron which is run at 2,200 vibrations per minute, with a work load of 300 pieces for 1 hour using a No. 2 chip size to remove or blend the flash remaining after the first operation.

Because this part is anodized, Dichromate sealed and painted, to protect against salt water, a fine finish is not required. This operation cleans up machining marks. The machine used is the Vibratron running at 2500 vibrations per minute with a work load of 300 pieces. Running time is 15 minutes. The chip is Coruloy A with sorted No. 2

One of the two separators which are used to handle the separation of media from parts from all the standard barrel machines.

sizes. It should be noted that these parts are loaded by hand, while the machine is running so the parts will not mar each other, as they might if they were dumped in together. Separation time on this operation is 7 minutes per load, including return of the chips to the machine.

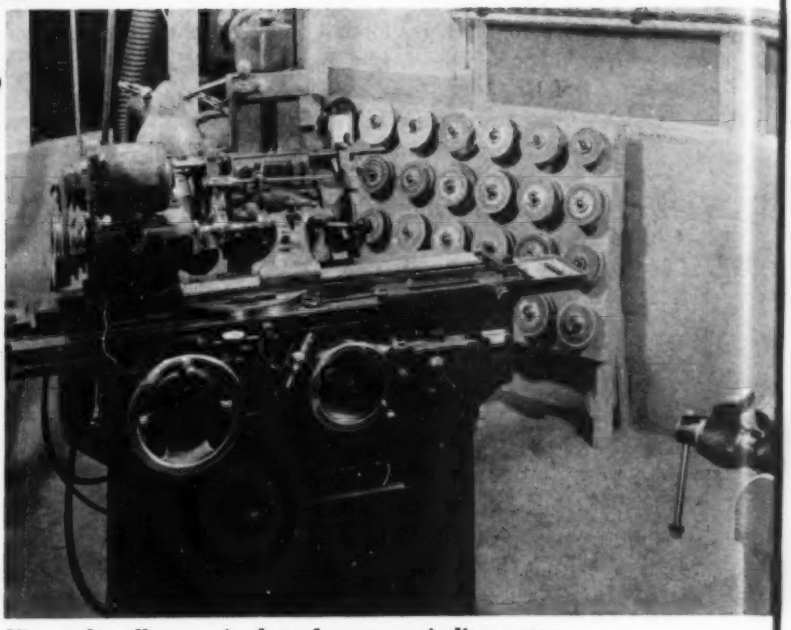
Each part which is processed through this finishing department is recorded on a Roto-Finish process Sheet (figure 1). The information of this sheet includes the part number and part name, operation number, machine type, machine speed, work load, running time, chip type, chip size, compound type and compound quantity. Opposite these categories are three columns which are described as grinding, bright honing, and coloring. These, of course, refer to the requirements of the operation.

• • •

Shown here are some of the single compartment Roto-Finish machines which are being used by Shakespeare.

What are the grinding characteristics of tool steels?

The variations in tool steels also present variations in grinding techniques. Speeds, feeds and general wheel specifications provide starting points for grinding of these materials. These "benchmarks" also will give some indication of the direction to move in order to solve problems of grinding these materials.



View of well organized tool room grinding setup. Note rack of grinding wheels for various tool steels. With this arrangement the operator can easily adapt his grinding for any of the many types of tool steels he is required to grind.

By JOHN A. MUELLER
Manager, Testing Department
Bonded Abrasives Division
The Carborundum Company

• Various tool steels must be ground differently due to the wide variations in composition and heat treatment which are used in making tool steels. In order to simplify the grinding of tool steels, an attempt has been made to classify them according to their relative ease of grinding and then to indicate the general grinding wheel specifications including grain type, grit size, wheel grade and bond to use for grinding each classification.

Following are some general specifications or guiding principles that are applicable to the grinding of tool steels and are also pertinent to any grinding operation.

1. To remove stock—use coarser grit wheels.
2. To produce finish—use finer grit wheels.
3. To generate form—use finer grit wheels.
4. To generate form—use dense structure wheels.
5. To grind hard metals—use softer grade wheels.
6. To grind hard metals—use finer grit wheels.
7. To grind soft metals—use harder grade wheels.
8. To grind soft metals—use coarser grit wheels.
9. To grind large areas—use softer grade wheels.
10. To grind small areas—use harder grade wheels.
11. Use the largest wheel both in diameter and in width that is consistent with the operation.

In addition to wheel selection, the method of using that wheel is important. For grinding tool steels satisfactorily, fast table speeds, light infeeds and small crossfeeds are generally required. It has also been found that a wheel which is kept sharp by frequent dressing with a sharp dressing tool will give much better grinding performance than a wheel that is permitted to become dull and glazed. When complex forms are to be ground and it is practical to use a grinding fluid, straight grinding oil will aid substantially in maintaining the form of the wheel and will permit the grinding to be done with fewer wheel dressings.

With this basic information as a background, specific recommendations for grinding tool steels can be made. Tool steels generally can be classified into the following groups.

1. High speed tool steels
   - Tungsten type—symbol T
   - Molybdenum type—symbol M
2. Cold work tool steels
   - High carbon—high chromium type—symbol D
   - Medium alloy air hardening type—symbol A
   - Oil hardening type—symbol O
3. Shock resisting tool steels—symbol S
4. Hot work tool steels—symbol H
5. Water hardening tool steels—symbol W
6. Special purpose tool steels
   - Low alloy type—symbol L

Each group is identified by a letter symbol and each steel within that group is identified by a

number. This number classifies the steel by chemical composition. For example, T-15 means that the steel is high speed tool steel of the tungsten type. It contains 1.50% carbon, 4.00% chromium, 5.00% vanadium, 12.00% tungsten and 5.00% cobalt.[1] Each group of tool steels has grinding characteristics that are peculiar to that group, and the classification of these characteristics will be the subject matter of the remainder of this article.

The grindability of tool steel refers to factors such as—

1. Ease with which metal can be removed.
2. Ease with which a finish can be produced.
3. Ability to remove metal without checking or cracking the metal.
4. Ability to generate forms in the metal.

It is well known that in some instances a metal which can be abraded easily is difficult to grind to a fine finish. Also, the ease with which metal is removed is not necessarily an indication of resistance to checking.

The factors that influence the grindability of metal include hardness, microstructure of the steel, and the quantitative presence of hard carbides which add wear resistance to the steels and decrease the life of the grinding wheels that are used to grind them. The hardness of the steel to be ground influences the grindability to a marked degree. Soft steels of the low carbon type with hardnesses on the order of Rockwell B89 tend to break down the grinding wheel very rapidly. As tool steel hardness increases, its grinding becomes easier. An optimum grinding condition appears to exist in the range of Rockwell C 30—35. The range from Rockwell C 35 to about C 65 is in the medium grindability area, and steels harder than C 65 fall into the low grindability range. Not enough quantitative data is available to relate grindability to microstructure. It appears, however, that fine grained steels are harder to abrade than coarse grained steels.

High Carbon—High Chromium Tool Steels, Symbol D

High carbon-high chromium steels are used for such products as lamination dies, burnishing rolls, and blanking dies. Because of the different chemical compositions, it might be expected that the grindability of these steels would be substantially different. Data that has been compiled shows that they are different in grindability in approximately the following order when ground with a given wheel under identical grinding conditions.

STEEL	GRINDING[1] RATIO	FINISH[2] RMS	GRINDABILITY
D2	30	13	Medium
D5	16	23	Medium
D7	10	26	Low

[1]Grinding ratio is the volume of metal removed divided by the volume of metal used to do the grinding.
[2]Finish is the surface roughness of the piece measured in microinches on a root mean square scale.

D2 and D5 fall into the medium grindability range, and general wheel recommendations for these materials are—

Grain type—Friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Select to suit the particular operation and the speeds and feeds that are being used.

D7 falls into the low grindability range. The grinding of this type of steel will be discussed in the next section.

High Speed Tool Steels, Symbols T and M

As noted in the symbols, high speed tool steels are divided into the tungsten type and the molybdenum type. The tungsten type are marked T1 through T15. The molybdenum type are marked M1 through M36. These steels are used in punches, dies, broaches, drills, reamers, and cutters and in tools for lathes, planers, and boring mills. These steels cover a wide range of chemical composition and grindability. In general M1 and T1 fall into the medium grindability range, and conventional speeds and feeds have been found satisfactory for grinding them. General wheel recommendations for M1 and T1 are—

Grain type—Friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Select to suit the particular operation and the speeds and feeds that are being used.

High speed tool steels that bear particular mention are those that contain vanadium in amounts of 4% or greater. These are called high vanadium steels and include M4, M15, T9, and T15. These steels are in a very low grindability range and require more time to grind than the other steels in the high speed category. They may at times require specialized grinding techniques to maintain size and to control finish. They are very sensitive to heat. Wherever feasible and practical to do so, lower than normal wheel speeds are recommended. Low wheel speeds minimize heat generation and reduce warpage of the work piece. Straight grinding oils aid in the grinding of these high vanadium steels, and are particularly helpful on form grinding operations. General wheel specifications together with suggested grinding conditions are—

Grain type —Friable aluminum oxide or green silicon carbide.
Grit Size —80-100
Grade —Soft
Bond —Vitrified
Wheel speed —Slow—approximately one-half normal.
Table speed —Fast as practical to use.
Infeed —Light—.0005" to .001" per pass.
Grinding fluid—Straight oil if practical or oil-water emulsion in heavy concentration.

It has recently been found that diamond wheels can be used economically to grind these high vanadium steels. Diamond wheels readily remove

[1]American Iron and Steel Institute Manual on Tool Steels.

steel and generate adequate finish. The economy of using diamond wheels depends upon prevailing labor and overhead costs and upon relative rates of metal removed permissible with diamond wheels compared to conventional abrasives. A rough approximation is that when the labor and burden rates for the grinding operation total $8.00 per hour or more, the use of diamond wheels should be considered. General diamond wheel specifications are 100 grit, 75 or 100 concentration, vitrified or resinoid bond in a soft grade. Grinding should be done wet, and the good grinding practices normally used with any diamond wheel should be followed.

The remaining classes of high speed tool steels fall into the low grindability range, and general wheel specifications for them are—

Grain type—Friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Select to suit the specific operation and the speeds and feeds that are being used.

Air Hardening Tool Steels, Symbol A

A typical air hardening tool steel has good resistance to wear, and is used chiefly in blanking, stamping and cold-forming dies. A large part of the grinding operations on this material fall into flat and form surface grinding. General practice suggests that the largest wheel practical, both in diameter and in width, be used for maximum performance. This type of steel has a medium grindability and presents no critical problem from the grinding point of view. Conventional speeds and feeds have been found satisfactory for grinding, and general grinding wheel recommendations are as follows—

Grain type—Friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Depends on operating conditions and area of grind. H grade is a popular starting suggestion.

Water Hardening Tool Steels, Symbol W

Water hardening tool steels exhibit substantial toughness and resistance to wear. They are used in such items as cold heading dies, wood and cold chisels, and tin snips. They fall into the medium grindability classification, and general wheel specifications are—

Grain type—Friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Select to suit the operation and the speeds and feeds that are being used.

Shock Resisting Tool Steels, Symbol S

Typical shock resisting tool steels are tough, and are used in chisels, cold sets, rivet busters, hammers, and studs and in bolts that are under severe stress. These steels are easy to grind. Conventional speeds and feeds are satisfactory, and general wheel recommendations are—

Grain type—Semi-friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.

When grinding these steels, a relatively hard grade wheel may be used to advantage without danger of checking or cracking the steel.

Hot Work Tool Steels, Symbol H

Hot work tool steel's chief advantage is resistance to the softening effect of heat. Consequently, it is used for shear blades, punches, and dies. Hot work tool steels are similar in grinding characteristics to the shock resisting steels. Grinding is not a critical operation, and general wheel recommendations are the same as those used for grinding the shock resisting steels.

Cold Work Tool Steels, Symbol O

Cold work tool steels have very good non-deforming properties and have wide usage in molding dies, broaches, hobs, and other forming tools. They are relatively easy to grind. Conventional speeds and feeds have been satisfactory, and general wheel specifications are—

Grain type—Semi-friable aluminum oxide.
Grit size —36 - 60 for surface grinding.
—60 - 80 for cylindrical grinding.
Bond —Vitrified.
Grade —Harder grade wheels can be used to advantage.

Special Purpose Low Alloy Tool Steels, Symbol L

Special purpose low alloy tool steels have usage, as the name indicates, for special purposes. Generally they are easy to grind, and the same recommendations for grinding shock resisting steels apply to the steels in this group.

Summary

Tool steels can be generally classified according to their grinding characteristics. Different steels in the same group, however, exhibit widely different grinding characteristics. Types L, S, H, and O are easy to grind. Types A, W, and D are in the medium grindability range. (D7 is an exception because it falls into the high vanadium group and may require special grinding techniques.) Groups M and T contain steels that have a wide range of grindability. M1 and T1 are in the medium grindability range. M4, M15, T9 and T15 are in the high vanadium group which requires specialized treatment. The other M and T steels are in the low grindability range which makes them highly resistant to abrasion.

The conditions of the grinding operation including such factors as speeds, feeds, grinding fluids, size and shape of the material ground, and the size and type of grinding wheel used to do the grinding, are very important to the results obtained with the various tool steels. The grinding wheel to be used for each grinding operation should be selected after due consideration has been given to those factors that have been outlined. Proper selection of the grinding wheel will provide improved grinding performance at minimum grinding cost. • • •

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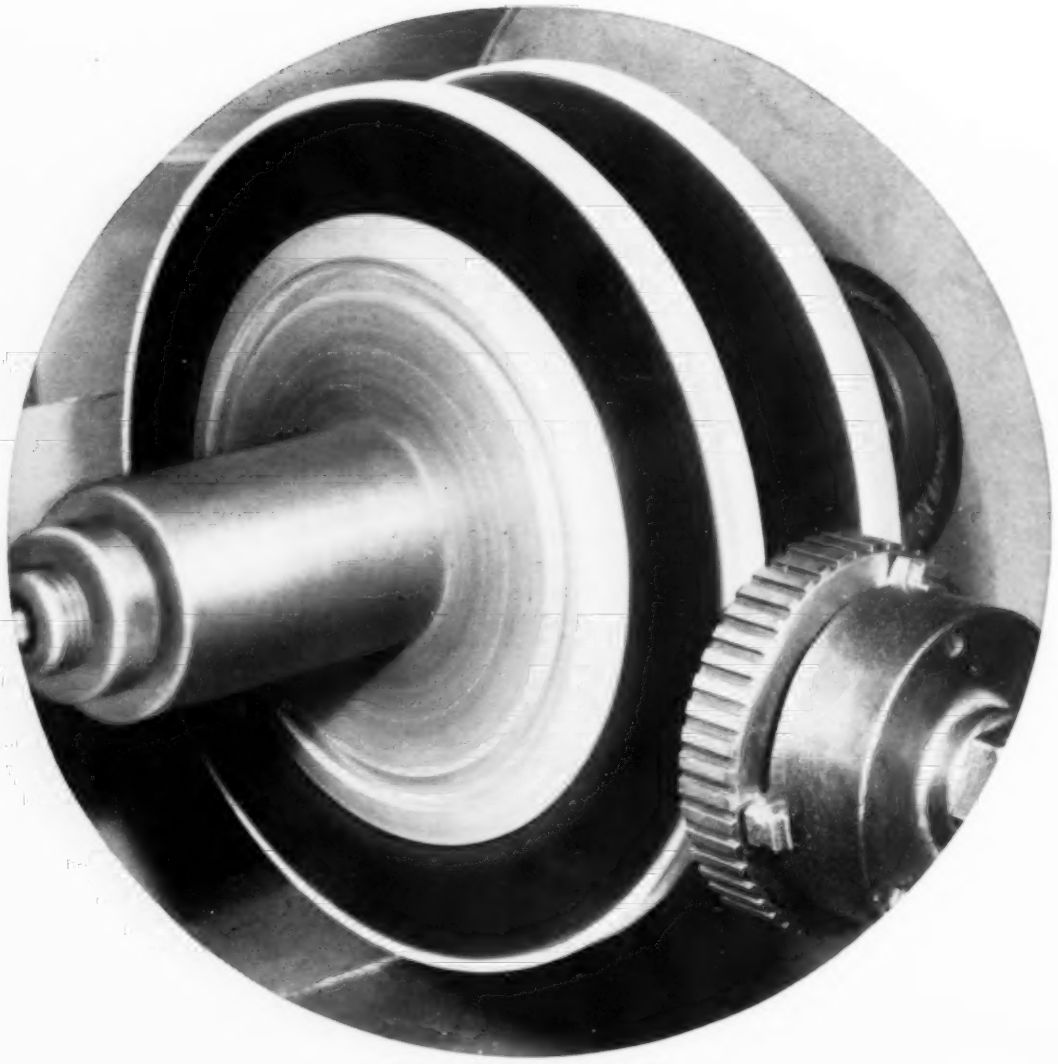

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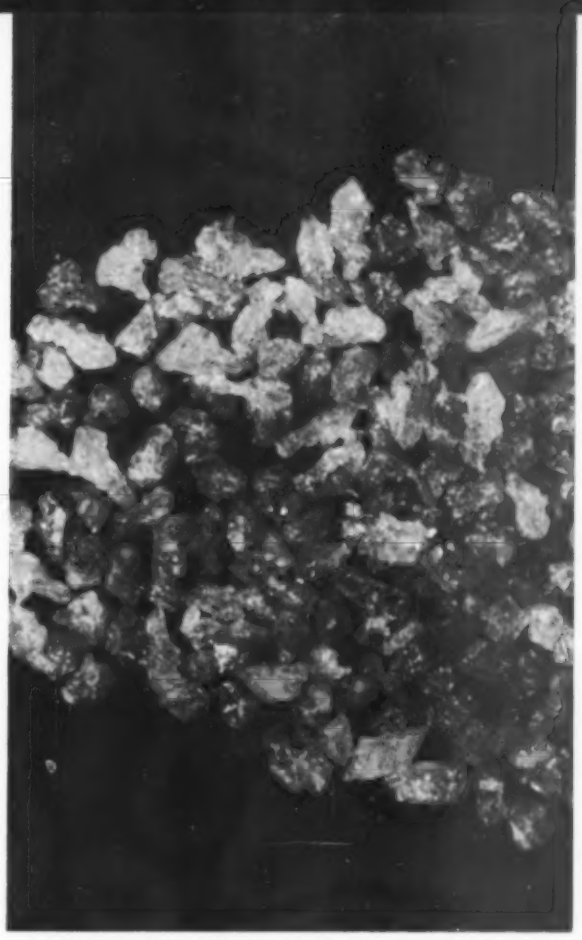
What do your diamond wheels cost?

MAN-MADE and NATURAL

Here are some test results which will serve as a check against your present findings on man-made and natural diamond wheels. They may provide data for those who are not able to check diamond wheel results. The results might even be of use in comparing present methods to the use of diamond wheels.



Man-Made diamond bort shown above illustrates the friability and extremely rough particle shape.

● Emphasis on the reduction of diamond wheel costs is judged so important that continuous studies are made in many plants to obtain the diamond wheel giving the lowest over-all grinding cost. It is considered, in many smaller plants, that results obtained are not worth the expense of the records involved and the time consumed. In many cases this is true because the great variety of shapes to be ground make it almost impossible to measure and compute volume versus wheel wear. The data presented here provides dependable information to those users not able to accurately compare wheel life; while also providing comparative information for diamond wheel users who are able to measure diamond wheel wear against volume of stock removed.

Laboratory Test Conditions:

The results that follow have been obtained in the laboratory under fixed conditions, but under conditions that might normally be found in any production shop except that only one grade of carbide was tested at any one time.

MACHINE—Norton S-3, 6″ x 18″ hydraulic surface grinder with automatic table speed and crossfeed.

WHEEL—5″ x 3/16″ resinoid DIAL (straight) wheels, 100 grit, 100 concentration.

CROSSFEED—.050″ per pass.

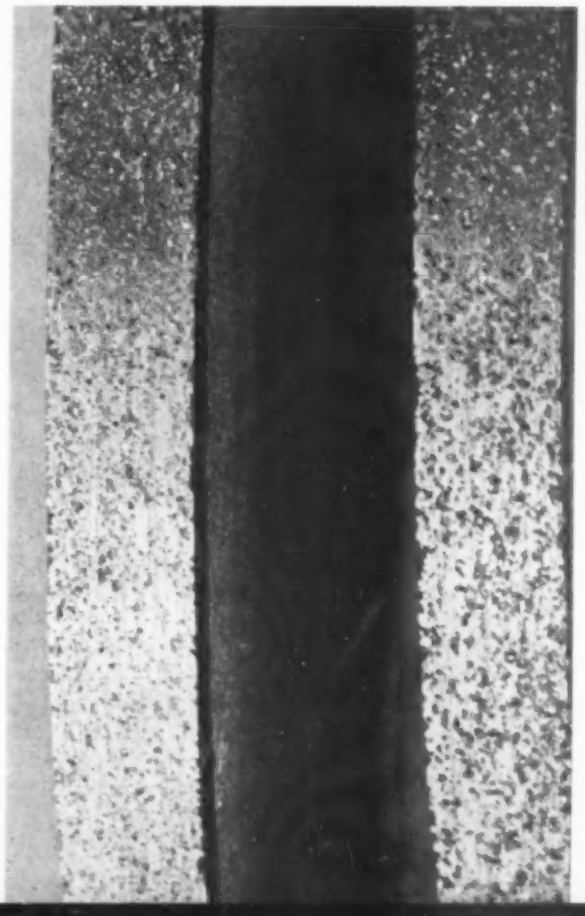
TABLE SPEED—50 feet per minute.

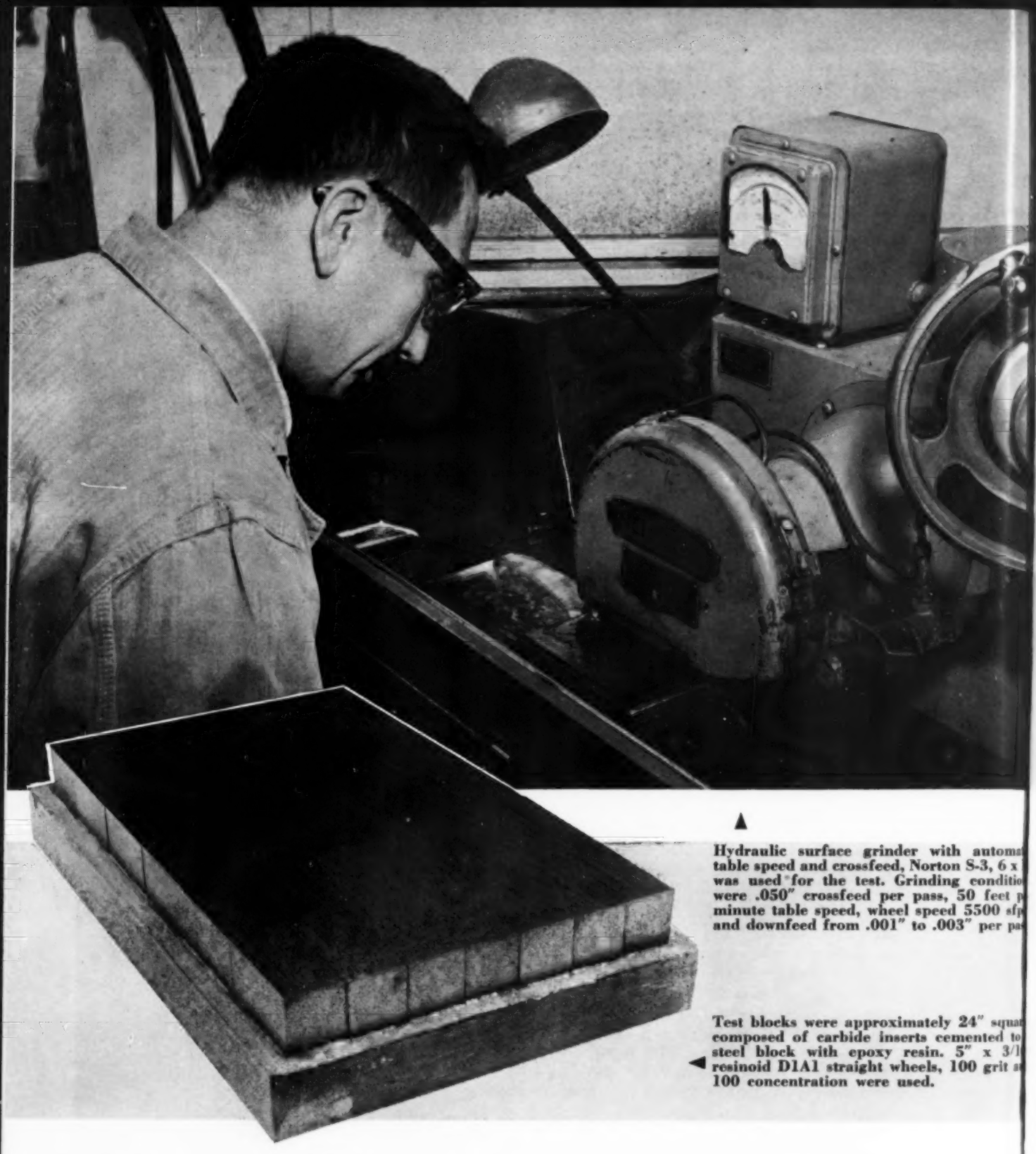
WHEEL SPEED—5500 surface feet per minute.

DOWNFEEDS varying from .001″ to .003″ per pass.

TEST BLOCKS—24 square inches in area (4″ x 6″) carbide inserts cemented to a steel block with epoxy resin.—Fig. 1.

The rough particle shape is further illustrated by these two wheels. The ability of rough particles to be held by the bond as in the case of the man-made diamond wheel on the left to the natural diamond wheel on the right, provides a definite advantage.





▲ **Hydraulic surface grinder with automa table speed and crossfeed, Norton S-3, 6 x was used for the test. Grinding conditio were .050" crossfeed per pass, 50 feet p minute table speed, wheel speed 5500 sfp and downfeed from .001" to .003" per pa**

◀ **Test blocks were approximately 24" squa composed of carbide inserts cemented to steel block with epoxy resin. 5" x 3/1 resinoid D1A1 straight wheels, 100 grit a 100 concentration were used.**

Diamond wheels of both natural and man-made diamonds were made at the same time with the same resin batch and cured side by side. The only difference was the diamond type.

Grinding Ratio Comparison:

A comparison of grinding ratios of man-made and natural diamonds in grinding wheels is shown below. In Table 1, the two diamond types were compared on three grades of Carboloy cemented tungsten carbide (Grades 883, 44A and 370) at downfeeds of .001", .002" and .003" per pass grinding with soluble oil-water coolant. Carboloy Grade 883 is a general purpose carbide for the machining of cast iron and non-ferrous materials, Grade 44A is a roughing grade used for non-ferrous materials and Grade 370 is for heavy duty roughing and general machining of ferrous materials except cast iron. (*See below) Grades 883 and 44A are 94% tungsten and 6% cobalt differing mainly in grain size, and Grade 370 is a carbide containing additions of tantalum and titanium.

*Note: Carbide area for Grade 883—26.6 sq .in., for Grade 44A—22.5 sq. in., and for Grade 370—21.7 sq. in. Time required for one complete crossfeed on test block—two minutes.

Of interest in Table 1 are the following main points:

1. The effect of different grades of carbide on wheel life.
2. The effect of increasing downfeed per pass on wheel life and
3. The comparison of man-made and natural diamond in all tests.

*Carboloy Grade 370 was chosen for most of the laboratory grinding evaluations because it represents one of the most popular steel-cutting grades.

In the plant, it is generally not practical to grind one grade of carbide when running wheel tests; in the laboratory, the effect of varying carbide grades on wheel life may be clearly illustrated. In comparing Grades 883, 44A and 370 respectively at .001" downfeed per pass the grinding ratio of the natural diamond wheel was 39, 32 and 22 versus 144, 103 and 76 for the man-made diamond wheel. At .001" downfeed per pass there is practically a 2:1 difference in wheel life when switching from a general purpose grade such as Grade 883 to Grade 370, the heavy duty steel machining grade. When feeds of .002" and .003" per pass are used, the bond holding the diamond particles will break down prematurely giving rise to less of a difference between carbide grades.

While it is considered very poor grinding practice to surface grind at .002" and .003" downfeed per pass, these conditions were evaluated to determine whether the higher friability of the man-made diamond at the heavier infeeds would be cause for failure. These results indicate that the efficiency of the man-made diamond wheel decreases by a larger percentage when grinding conditions are changed from .001" to .002" downfeed per pass but they continue to maintain a 38% to 77% superiority even at the heavier downfeeds. Note the drastic reduction in wheel life as downfeeds are increased from .001" to .002" to .003" per pass—on Grade 370 the grinding ratio for the wheel containing natural diamond is reduced from 22 to 12 to 9 and the grinding ratio for the man-made diamond wheel is reduced from 76 to 18 to 13.

While the man-made diamond is markedly superior in all cases, the superiority is greatest at .001" downfeed where the per cent superiority varied from 222% to 270%.

Comparison of Wheel Wear:

Table 2, below, shows the amount of diametrical

TABLE 1
COMPARISON OF GRINDING RATIOS
(Cubic Inches Carbide Removed Per Cubic Inch of Wheel Wear)
ON THREE GRADES OF CARBIDE AT .001", .002", and .003" DOWNFEED PER PASS

Carbide Grade	883			44A			370		
Downfeed/Pass	.001"	.002"	.003"	.001"	.002"	.003"	.001"	.002"	.003"
Natural Diamond	39	17	13	32	14	8	22	12	9
Type RVG	144	30	18	103	20	13	76	18	13

TABLE 2
COMPARISON OF WHEEL WEAR PER CUBIC INCH OF CARBIDE REMOVED
Wheel Wear/Cubic Inch Carbide Removed

Carbide Grade	883			44A			370		
Downfeed/Pass	.001"	.002"	.003"	.001"	.002"	.003"	.001"	.002"	.003"
Wheel wear—Nat. Dia.	.0174"	.0405"	.0530"	.0210"	.0492"	.0857"	.0306"	.0595"	.0840"
Wheel wear—Type RVG	.0047"	.0227"	.0390"	.0065"	.0334"	.0517"	.0088"	.037"	.0527"

TABLE 3
COMPARISON OF CARBIDE REMOVAL RATES*
PERCENTAGE CARBIDE REMOVED PER UNIT TIME

Carbide Grade	883			44A			370		
Downfeed/Pass	.001"	.002"	.003"	.001"	.002"	.003"	.001"	.002"	.003"
Natural Diamond	100%	100%	100%	100%	100%	100%	100%	100%	100%
Type RVG	116%	117%	120%	118%	116%	119%	123%	116%	125%

TABLE 3A
COMPARISON OF TIME (MINUTES) REQUIRED TO REMOVE 1 CUBIC INCH OF CARBIDE* UNDER CONDITIONS AS OUTLINED

Carbide Grade	883			44A			370		
Downfeed/Pass	.001"	.002"	.003"	.001"	.002"	.003"	.001"	.002"	.003"
Natural Diamond	94	58	46	116	70	59	123	74	62
Type RVG	81	49	38	98	60	50	100	64	49

*Note: Carbide area for Grade 883 - 26.6 sq. in., for Grade 44A - 22.5 sq. in., and for Grade 370 - 21.7 sq. in. Time required for one complete crossfeed on test block—two minutes.

TABLE 4
COMPARISON OF MAN-MADE, NORMAL, AND NATURAL SND TREATED
Grade 370 - .001" Downfeed

	Grinding Ratio	Wheel Wear Per Cubic Inch Carbide Removed	Carbide Removal Rate
Natural	22	.0306"	91%
Natural SND Treated	37	.0185"	100%
Type RVG	76	.0088"	112%

TABLE 5
COMPARISON OF TYPE RVG DIAMOND AND NATURAL DIAMOND
GRINDING GRADE 370—INTERRUPTED AND UNINTERRUPTED CUT
(.001" DOWNFEED)

UNINTERRUPTED CUT

	Grinding Ratio	Wheel Wear Per Cubic Inch Carbide Removed	Carbide Rate
Natural	22—100%	.0306"—100%	100%
Type RVG	76—345%	.0088"— 28%	116%
INTERRUPTED CUT			
Natural	23—100%	.0276"—100%	100%
Type RVG	81—350%	.0084"— 30%	122%

wheel wear obtained per cubic inch of carbide removed. The per cent superiority of the man-made diamonds remains the same as that shown in Table 1, since this tabulation is another way of presenting the data. The main purpose in presenting the data in this form is to show not only that wheel wear of the man-made diamond wheels is consistently lower for an equal volume of stock removal but to show the effect on wheel wear as downfeed is increased.

Stock Removal Rates Favor Man-Made Diamonds:

In the surface grinding comparison shown in Tables 1 and 2, man-made diamonds removed more carbide per unit time than the natural diamonds under the test conditions as outlined above. The reason for this is that for each grinding pass of .001" downfeed, the man-made diamond wheel will wear less than the natural diamond wheel and hence will grind more carbide. Since specific downfeed equals wheel wear plus depth of cut, it follows that the less the wheel wear, the greater the actual depth of cut. The results shown in Table 3 indicate the additional amount of carbide with the man-made diamond in the same unit time and do not include the factor of wheel wear. Not only does the man-made diamond wheel provide greater life, but the grinding time to remove the same volume of carbide is significantly less. In all tests, the surface finish produced by both diamond types was identical.

As shown, the man-made diamond wheel will remove from 16% to 25% more carbide in the same unit time. In a specific example, grinding Grade 370 Carboloy for a total of 50 passes of .001"/pass on the same test block, the man-made diamond wheel ground 1 cubic inch while the natural diamond wheel ground only .81 cubic inches of carbide in 100 minutes of actual grinding time.

As shown in Table 3A, in order to remove a cubic inch of carbide, it would take approximately 50% as long when grinding at .003" downfeed per pass as at .001" downfeed per pass but the increased wheel wear at the heavier downfeed of .003" per pass would normally be considerably more costly in terms of wheel life than the labor saving due to the shorter grinding time.

Comparison of Man-Made Versus New Natural SND:

A comparison of the man-made diamond with the natural untreated and natural SND treated is shown below for the surface grinding of Grade 370 Carboloy at .001" downfeed per pass. In all cases, the Type RVG (resinoid-vitrified grinding) was compared with the natural.

The man-made diamonds in this test indicated a grinding ratio (cubic inches of carbide removed per cubic inch of wheel wear) of 76 versus 37 for the natural SND treated and 22 for the untreated natural.

The above data for the natural and SND treated compares closely with the data from the excellent report by Dr. R. G. Weavind, Director of Research at the Diamond Research Laboratory (DeBeers), entitled "Factors Affecting the Efficiency of Resin Bonded Diamond Grinding Wheels". The data below are from page 8, Table 7 of Dr. Weavind's report, grinding an unknown grade of carbide at .001" per pass, comparing coarse grit SND diamond and 100 grit normal natural.

	GRINDING RATIO
Normal Natural	27 — 100%
SND Natural	39 — 144%

There is remarkable correlation in the results shown in Dr. Weavind's report (above) and the grinding ratios of 22 and 37 as shown in the work of the General Electric Diamond Application Test Laboratory (Table 4). In a straight wheel for peripheral grinding, the natural SND treated appears to be more efficient than the normal natural diamond but only 50% as efficient as the Type RVG man-made diamond. It is not known how the SND natural compares with the normal natural diamond in cup wheels.

Since all of the tests shown above were performed on 4" x 6" x ½" solid blocks of carbide, a condition not commonly found in the field, test blocks were assembled to give interrupted cuts. In examining the above data, it occurred to the writer that in relatively few instances is a large block of carbide ground in the toolroom or shop. In order to ascertain the effect of diamond grinding a block of carbide with interrupted cuts, a test was initiated using the same area of carbide but spacing the carbide inserts so that there was an interruption of ½" between pieces as shown in Figure 2. The blocks were made with Grade 370 Carboloy using test conditions of .001" downfeed per pass.

The results show that for all practical purposes, the wheel wear and grinding ratio are essentially the same whether grinding a solid block or one in which there are interrupted cuts. The wear seems wholly dependent on the volume of carbide ground rather than test block configuration.

Superiority Due to Friability and Particle Shape:

The improved performance of the man-made diamond may be attributed to two basic factors —friability and particle shape. The term friability is used to define the important ability of a particle to break down as points dull, generating progressively new keen cutting edges. Thus, instead of dulling occurring to the point where the crystal is pulled out of the bond, new cutting edges result so that the crystal is retained much longer in the bond and available to do useful work. This also means that a friable crystal contributes to the retention of corners on wheels more effectively. From the point of view of abrasive technology, the difference between man-made diamonds and natural diamond is significant. A basic consideration is the matter of bonding to hold the abrasive grain in position until it has done its abrasive job. The rough surface characteristic of the man-made diamonds with protrusions and re-entrant angles that enable them to be retained much more effectively in the bond is the other factor accounting for their superiority. The ability to remain in the bond until used up may be shown in Figure 3 of the man-made and natural diamond wheel surfaces. The G.E. wheel shows relatively few holes where diamonds have literally popped out of the bond. • • •

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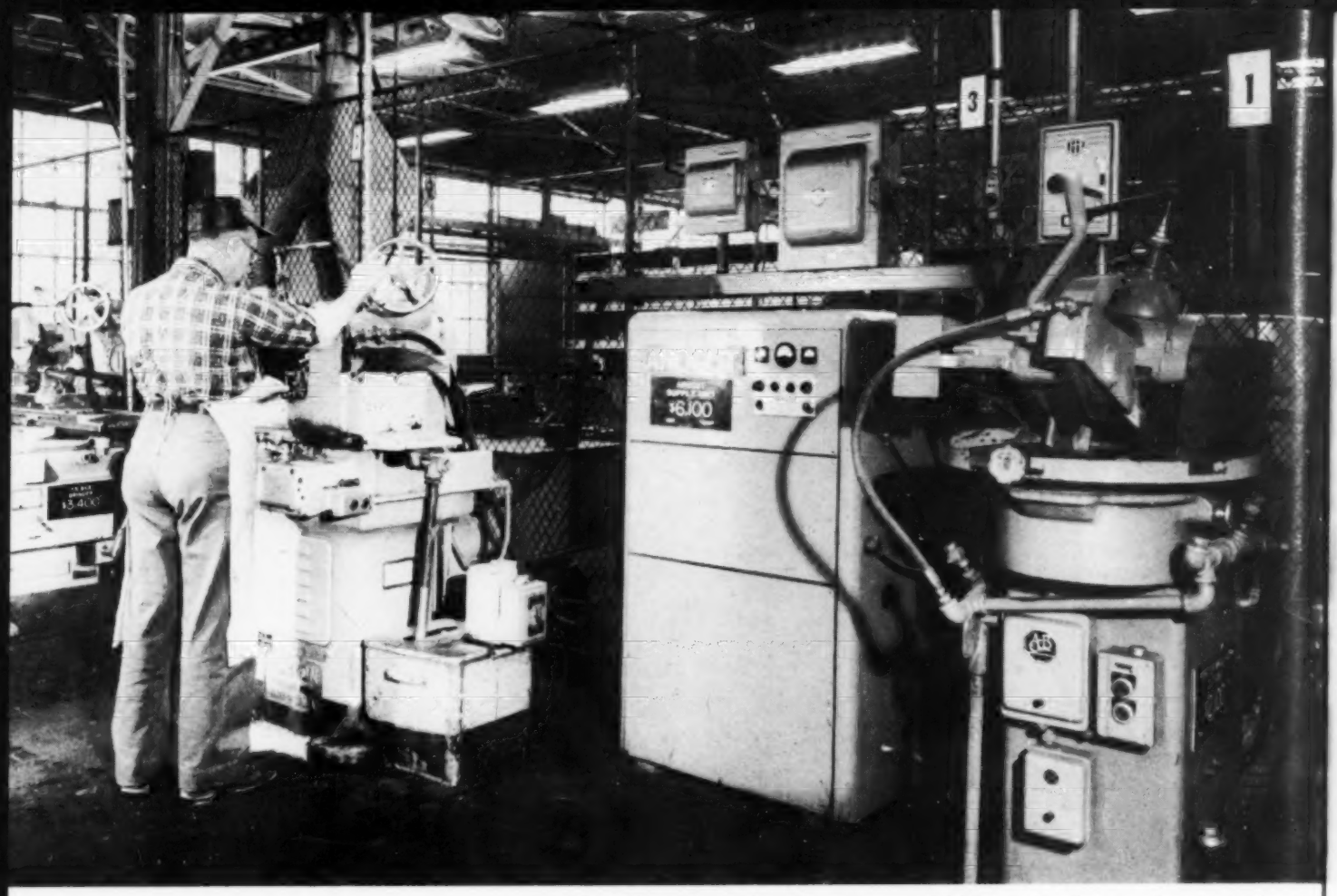


Carbide tool grinding department of Timken Gambrinus plant includes the Anocut 300 ampere unit combined with Porter-McLeod cutoff machine and Norton 6 x 18 surface grinder. Complete chip breaker is ground in one pass. Cutoff machine salvages solid carbide tools by cutting off the damaged end.

at Timken

While Carbide Tool Use Increased, Tool Room Grinding Cost Decreased

Increased use of carbide tools by automatic screw machine departments of Timken Roller Bearing Company should have increased tool room grinding costs. However, the use of electrolytic grinding methods allows complete grinding of tools in one setup and reduced grinding wheel usage from 7 to 1.

● The use of carbide cutting tools in the automatic screw machine departments of The Timken Roller Bearing Company in Canton, Ohio, increased considerably during the past several years. Correspondingly, the consumption of expensive diamond wheels used for the grinding of these tools became greater. This grinding cost has been alleviated in certain areas with the introduction of the electrolytic process.

In the carbide tool grinding department of the Timken Gambrinus plant an Anocut 300 ampere unit has been combined with a Porter-McLeod cutoff machine and a 6 x 18 Norton surface grinder. The surface grinder is used to grind chip breakers on cutoff, turn, bore and breakdown tools.

A complete chip breaker is ground on the tool with one pass of the grinding wheel. It is usually to a depth of .018 inches to .020 inches and to a width ranging from .045 inches to .080 inches depending upon the tool application. The metal bond diamond grinding wheel used is 3/16 inches wide, 8 inches in diameter, 150 grit and 100 concentration. Since it is only possible to use one side of the wheel at a time, a reversible adapter is used so that both sides of the grinding wheel can be utilized before wheel dressing is required. It has been determined for this particular application that the best results are obtained with the Anocut power unit set at 7-1/2 volts which produces a surface

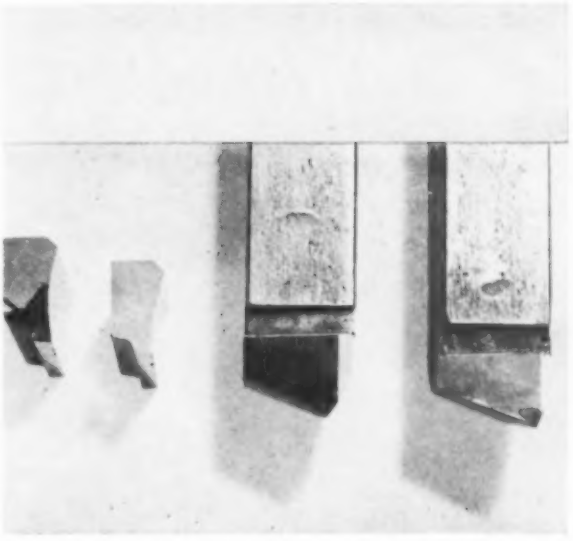
finish of 5 to 10 micro inches. The rate of feed is controlled so that the unit normally operates with 100 to 150 amperes.

Chip breaker dimensions are considered vital for the control of chips which directly affect tool life, therefore, they are held to close tolerances and carefully inspected 100 per cent on a Kodak Contour projector.

Prior to the introduction of the electrolytic process, chip breakers were ground on grinders using conventional vitrified bonded diamond wheels. The grinding cycle was 25 to 30 seconds and excessive chipping and flaking of the carbide edge was apparent. With the use of electrolytic grinding the grinding cycle is 7 seconds and chipping and flaking of the cutting edges has been reduced considerably. Grinding wheel use has also been reduced by a ratio of 7 to 1.

Due to the nature of electrolytic grinding, the grinding wheel merely assists in the removal of the carbide, hence exerting little pressure on the spindle and bearings which minimizes maintenance. With the previous method, the constant pressure made it necessary to repair both spindles and bearings frequently since a high degree of accuracy was essential. In the over two years that the electrolytic grinding method has been in use only minor service has been required on the power supply unit and the surface grinder. Maintenance has proved an important "plus factor" since the machine is run 24 hours per day.

The coolant solution which conducts the current between the diamond wheel and the carbide is a mixture of four pounds of electrolytic salt to five gallons of water. The mist from this solution is collected at the point of grinding contact and returned to the supply tank.



The tools in the center have been ground. The tools on the outside show the extreme conditions from which these tools can be salvaged.

The Porter-McLeod cutoff machine completes the first step in the salvage of solid carbide tools, that is, cutting off the broken end. Because of their design, some of the solid carbide tools are expensive; and being able to cut off the damaged end affords a considerable savings. The cutoff machine is attached to the same power supply unit as the surface grinder and therefore cannot be operated at the same time. The cutoff machine is used periodically when enough solid carbide tools of salvageable size have accumulated.

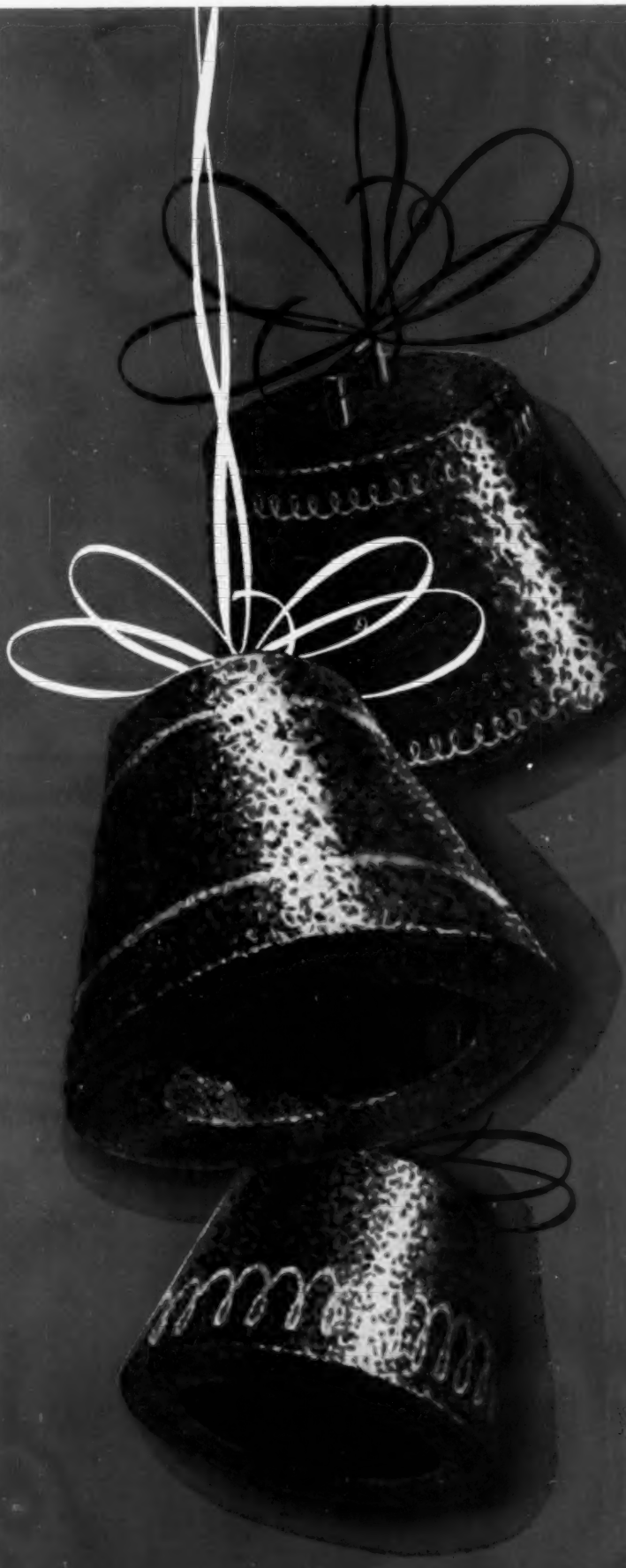
The Canton plant of the Timken Company has a second Anocut power unit in operation in conjunction with a Hammond oscillating carbide tool grinder. This unit completes in one setup the rough and finish grinds on carbide-tipped tools. At the present time only tools with a single cutting edge where the profile and point location are not critical are ground on this machine. Most common are tools used for turning, boring and chamfering. On this operation it has been determined that this unit operates most efficiently with a voltage setting of 7 to 9 volts with a load of 200 to 240 amperes and with a grinding wheel oscillation of 60 to 70 per minute.

Previously, this grinding operation was performed by rough grinding on a machine equipped with a silicon carbide wheel followed by a finish grind on a machine with a diamond lap wheel. Two important advantages have been gained by using the electrolytic process. First, the complete grinding is done in one operation with one setup. Second, diamond grinding wheel use has been reduced by a ratio of 7 to 1.

The successful application of electrolytic grinding of carbide tools at Canton and Gambrinus plants has resulted in the Timken Company installing additional units for use in the carbide tool grinding departments of its other bearing plants.

• • •

Timken Canton plant has second Anocut unit with Hammond oscillating carbide tool grinder. Combination of equipment completes in one setup the rough and finish grinding of carbide-tipped tools.



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What article in this issue interested you most?_____

What subjects would you like to see published in future issues? _____

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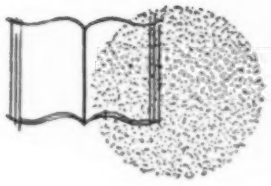
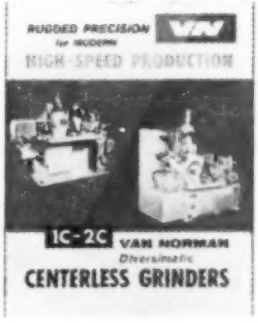


Literature

1. Centerless Grinders. Colorful 28-page brochure presents the full story on Van Norman Diversimatic centerless grinders. Well-illustrated with photos and sketches of the machines, the piece supplements the text. Features of the machine are fully explained, and complete specifications are given. Form 1C-2C. Van Norman Machine Company, 3640 Main Street, Springfield 7, Massachusetts. (A division of Van Norman Industries, Inc.)



(See Number 1)

2. Abrasive Cutting. A new booklet issued by American Chain & Cable Company, Inc., stresses the wide range of products manufactured by that company. Of great interest are the abrasive cutting machines and wheels manufactured by Allison-Campbell Division. Others are such diverse products as lawn mowers and overhead traveling cranes; hardness testers and pressure gages; nibbling machines and digital data logging equipment. American Chain & Cable Company, Inc., 929 Connecticut Avenue, Bridgeport 2, Connecticut.

3. Portable Power Tools. Plant studies show that portable power tools may be producing only 60% of rated output, according to a new 28-page report published by Ingersoll-Rand Co. The publication shows how a planned annual re-tooling program can increase output of grinding and similar production operations. The guidebook offers basic formulas for computing the dividend on payroll dollars possible by planned annual re-tooling. A handy slide rule computer is a companion piece. Forms 5250A and 5290. Ingersoll-Rand Co., 11 Broadway, New York 4, N.Y.

4. Power Tools. A new 16-page catalog on a complete line of power tools is now available from Wilton Tool Manufacturing Co. Included are descriptions and specifications for hydraulic clamping heads, air-hydraulic boosters, power tool accessories, air-hydraulic machine vises, and heavy duty air cylinders. Catalog No. 724. Wilton Tool Manufacturing Co., Inc., 9525 Irving Park Road, Schiller Park, Illinois.

5. Diamond Data. Volume 1, Numbers 7-8 of this technical publication of Engelhard Hanovia's Industrial Diamond Division features a four-page article on the relationship of particle shape and grinding efficiency by two research engineers from the company. Technical Information Department, Engelhard Hanovia, Inc., 75 Austin Street, Newark 2, New Jersey.

(See Number 3)

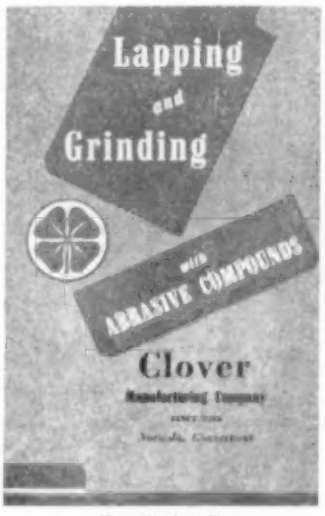
6. Automatic Form Grinders. Six-page two-color folder describes the latest models of Jones & Lamson automated form grinders. Both machines feature Perpetual Form Control for wheel trueing. Model E-2 uses the standard J&L trueing devices with PFC, and Model E-3 has a new type of vertical trueing device which offers a full 12" of wheel spread with PFC. Jones & Lamson Machine Company, 522 Clinton Street, Springfield, Vermont.

7. Resinoid and Metal-Bond Diamond Wheels. A 16-page catalog with profiles and prices of the latest type diamond wheels and hones has just been issued by O'Rourke Diamond Company. Featured are a full line of resinoid-bond wheels with natural or man-made diamonds and special metal-bond wheels for electrolytic grinding. The latter are available with diamond or non-diamond abrasive. O'Rourke Diamond Company, 11411 Vanowen Street, North Hollywood, California.

8. Precision Vertical Grinders. Eight-page two-color pamphlet details specifications, adaptations and accessories for the Frauenthal 1800 series of double head super-precision vertical grinders. Adaptations include a variety of spindle combinations, a high-column unit, a large unit with a 66" diameter table and 72" swing, and an "economy" single spindle machine. Bulletin 803. Frauenthal Division, The Kaydon Engineering Corporation, McCracken Street, Muskegon, Michigan.

9. Lapping and Grinding Compounds. A 16-page booklet just issued by Clover Manufacturing Company provides general data on machine and hand lapping. Basic rules and standard practices are outlined. Suggestions for some of the less-common applications, it is said, may bring to mind still other uses of the lapping process for those interested in accurate surfaces. A list of shop kinks is also included. Clover Manufacturing Company, 327 Main Street, Norwalk, Connecticut.

continued



(See Number 9)

To obtain literature use Reader Service cards on page 43. Circle on the card the number which appears at the start of the paragraph describing the literature you request.

FREE LITERATURE *continued*

10. Manually Operated Chucks. Catalog 67 is a substantial volume of information about the Cushman line of manually operated chucks. The current issue was brought out in 1959, has been brought up to date with a current price list and supplements. Blueprints, photos and complete specifications tell the story. Catalog No. 67. The Cushman Chuck Company, 806 Windsor Street, Hartford 2, Conn.

11. Snagging Handbook. This 16-page brochure is a wide-ranging reference on snag grinding, of particular interest to foundries, metal fabricators, and steel mills. Featured are such sections as standard shapes of snagging wheels, a discussion of grinding costs, considerable material on grinding wheel safety, and related basic information. Peninsular Snagging Handbook, The Peninsular Grinding Wheel Division, Abrasive and Metal Products Company, 729 Meldrum Avenue, Detroit 7, Michigan.

12. Steel Abrasive Performance Data. Performance and statistical data compiled in extensive abrasive research and experimentation are revealed for the first time in a new Handbook of Blast Cleaning Abrasive Performance, Bulletin 903-D. Topics discussed include the relationship of performance and economy; how abrasive breakdown characteristics affect finishes and costs; the effect of abrasive hardness on cleaning speed; abrasive size and finish quality; controlling finish achieved by airless blast cleaning. Charts and graphs illustrate the effect of abrasive size mixture, shot consumption averages, the per cent of wheel efficiency at which blast equipment is operating and the relationship of abrasive price and consumption to actual costs. Wheelabrator Corporation, 1169 South Byrkit Street, Mishawaka, Indiana.

13. Universal Tool Grinders. The Grand Rapids No. 70 and No. 80 hydraulic feed universal tool grinders are described in this bulletin. The two machines are similar in many respects, with the No. 80 slightly the larger. Various features of the two machines are detailed, and comparative specifications are tabulated. Other grinders in the Gallmeyer & Livingston line are briefly listed, with references to the bulletins containing complete descriptions. Bulletin GL-4-60. Gallmeyer & Livingston Co., 336 Straight Avenue, S. W., Grand Rapids 2, Michigan.

14. Surface Grinders. "Work Done on the Blanchard" is a collection of examples designed to show the versatility and wide scope of Blanchard grinding. They illustrate the grinding and finishing of flat surfaces on a wide variety of materials, sizes, limits and finishes. Ferrous and non-ferrous metals are included, along with glass, carbon, plastics, quartz and other minerals. Form No. 399. The Blanchard Machine Company, 64 State Street, Cambridge 39, Mass.

(See Number 14)

15. Microstoning Equipment. The first complete information on all Taft-Peirce Supfina Microstoning equipment is now available in a new comprehensive handbook, designated as catalog 319. The text explains the advantages of microstoning, a new process in which special abrading or polishing stones are oscillated against moving work pieces to generate controlled microinch finishes while correcting out-of-roundness and removing surface imperfections left by prior machining. Catalog 319. Taft-Peirce Mfg. Co., 32 Mechanic Avenue, Woonsocket, Rhode Island.

16. Height Gages. Two-color sheet punched for standard three-ring binder gives complete data on new Mueller hard chrome plated vernier height gages. Brief sketches of related gages are included. Mueller Gages Company, 1052-1058 North Allen Avenue, Pasadena, California.

continued

ATLANTIC WHEELS SPEED UP CUTTING!

A quick pass will tell you! Atlantic Grinding Wheels are *engineered* to float right through those roughest jobs . . . give faster, cooler, cleaner cutting action with less pressure and operator fatigue. Result: increased production. And you keep cutting costs down with Atlantic Wheels.

Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

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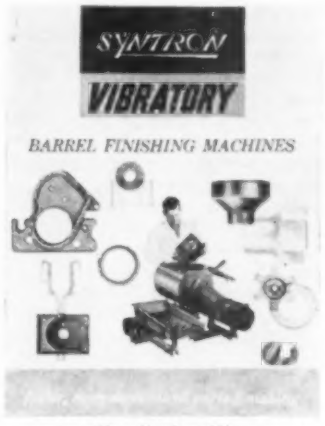
17. Surface Grinder. Four-page two-color flier describes the King Model K-1020 hand feed surface grinder, set forth as a "large-capacity surface grinder of ultimate precision and moderate price." The unit offers a full 1½ hp balanced motor and direct drive spindle, plus "many other features found only in more expensive grinders." Specifications are listed, and available accessories are described. King Machine & Mfg. Co., 1171 East 32nd Street, Los Angeles 11, Calif.

18. Masonry and Concrete Saw Blades. Two-page folder punched for standard three-ring binder gives details and prices on DTR masonry and concrete saw blades with diamonds set in tungsten carbide. Both types of blade are offered in three bonds and a variety of sizes. Diamond Tool Research Co., Inc., 380 Second Avenue, New York 10, New York.

19. Vibratory Finishing. A new four-page folder on the Syntron vibratory barrel finishing machine includes specifications, data and illustrations of the company's newer models for descaling, deburring, grinding, polishing, burnishing, or drying of unfinished parts. Authentic "before and after" illustrations are included. Syntron Company, 1253 Lexington Avenue, Homer City, Pennsylvania.

20. Segment Specifications. This Grinding Wheel Institute publication is a handy reference for all users of surface grinders on which segments mounted in chucks are used. For each of the various types it shows a typical assembly including the holding device, together with a tabulation of specifications-set number, diameter of

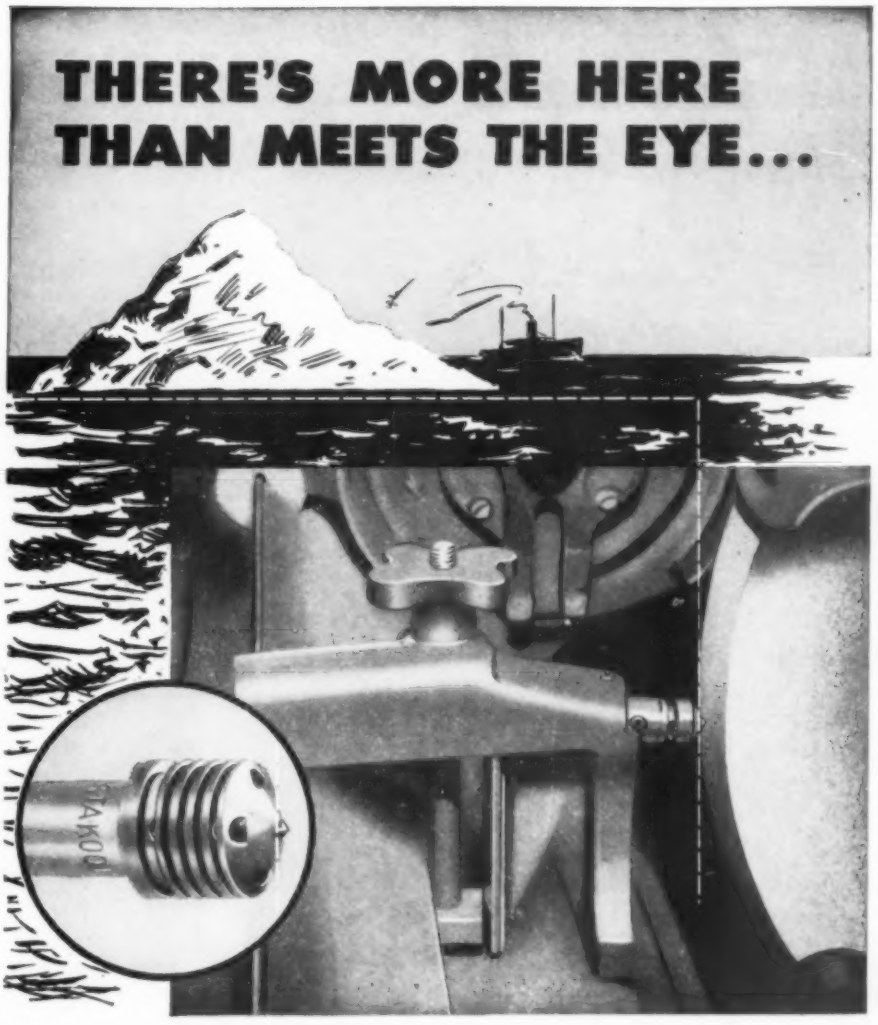


(See Number 19)

the chuck in inches, size of the segments, and the number per set. The Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio.

21. Standard Diamond Tools. In a comprehensive 36-page catalog, The Staset Company, Inc., has now made available diagrams, specifications and pricing information on 232 standard diamond tools. In addition, this handy source provides fully illustrated sections covering cluster and impregnated tools, radius dressing tools, Staset "rib-nib" mounting, wheel type tools, grit and tandem tools, and blade type tools, as well as complete information on Turn-A-Tool, the new design which provides a quick and easy way to keep the diamond sharp. Catalog No. 460. The Staset Company, Inc., 70 Franklin Avenue, W. Orange, New Jersey.

22. Grinding Wheel Catalog. Six sections on vitrified wheels, resinoid wheels, reinforced resinoid wheels, rubber wheels,



In an iceberg or in a J. K. Smit Diamond Tool only a fraction shows above the surface.

Everyone knows about the unseen portion of an arctic iceberg. Many do not realize the unseen factors that lie beneath the surface of a J. K. Smit Diamond Tool, such as . . . our constant research to find still better methods of manufacturing Diamond Tools, the unquestioned integrity of our company since 1888, the manufacturing skills that have been learned and passed on through all those years, and quality control of manufacture for tool duplication.

All these hidden assets count much toward maintaining our position as a leader in the industry today.

When *your* next job specifies a diamond tool for any purpose contact J. K. Smit. Our field representatives are trained and qualified to assist you with any standard or special application.

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FREE LITERATURE *continued*

plate-mounted wheels, and jointer and dressing stones make up this catalog from Chicago Wheel & Mfg. Co. Shapes available in each type are sketched, and an explanation of the company's standard wheel marking is included. Bulletin No. 7525. Chicago Wheel & Mfg. Co., 1101 West Monroe Street, Chicago 7, Illinois.

23. Automatic Cutter Grinder. Twenty-page loose-leaf brochure describes the operation and the specifications of the new Ingersoll automatic cutter grinder. Profusely illustrated, the piece lists the advantages of the machine for shops where maintaining inserted-blade milling cutters is an around-the-clock job, and where the number of cutters ground per week warrants investing in time- and labor-saving equipment. The machine is said to be suited to a wide range of inserted blade face milling cutters, to duplicate accurately cutter after cutter, to do all grinding operations on cutters, and to generate its own control cams from cutter blade contours or from any master cam. The Ingersoll Milling Machine Company, 505 Fulton Ave., Rockford, Ill.

24. Abrasive Wheel Dressing. What is hailed as a new concept in dressing abrasive wheels is outlined in a recent bulletin issued by the Sidley Diamond Tool Company. The bulletin illustrates an electronically controlled power-driven circular dressing wheel known as the Sidley diamond Crushcutter traverse dressing tool. It is used in dressing grinding wheels for all kinds of operations. Reports by the maker are that the Crushcutter gives the user faster, cooler, and more accurate dressing. Sidley Diamond Tool Company, 26045 West Seven Mile Road, Detroit 40, Michigan.

25. Dust Control Equipment. A new composite product bulletin which covers the complete line of dust control equipment manufactured by American Air Filter Company has just been released. Discussing the four main types of dust control products—dry centrifugals, wet collectors, fabric collectors, and electrostatic precipitators—the bulletin explains and illustrates 13 different AAF products, their capacities, and their specific applications. Bulletin No. 271. American Air Filter Company, Inc., 215 Central Avenue, Louisville 8, Kentucky.

(See Number 27)

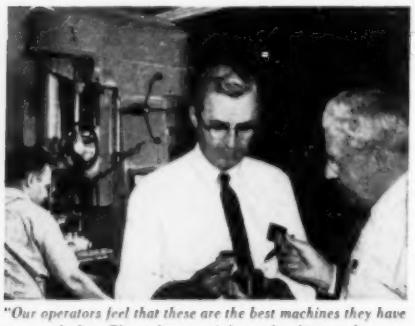
26. Toolroom Wheels. The Simonds Abrasive line of SA Borolon wheels is described, wheel shapes for both tool and cutter grinding and for surface grinding are shown, and recommended specifications for various tools and materials are listed. Also included are diamond and green silicon carbide wheels for carbide tools. Ordering instructions are also given. This four-page folder is punched for standard binders. Simonds Abrasive Co., Philadelphia, Pa.

27. Magnetic Coolant Separators. Eight-page catalog provides detailed information on BarnesdriL magnetic separators. Production savings are outlined, operation of the separators is explained, and typical installations are illustrated. Catalog No. 300-D. Barnes Drill Co., 886 Chestnut Street, Rockford, Illinois.

28. Chuck and Collet Actuators. PowerGrip's new circular No. 31060 illustrates, with technical information, their complete line of non-rotating air cylinders with large center hole for operating air and collet chucks. Principles of construction and operation are explained. Catalog No. 31060. PowerGrip, Inc., Main Street, Rockfall, Connecticut.

"The No. 3's split the tenths!"

So report users of Moore's New Jig Borer and Jig Grinder



"Our operators feel that these are the best machines they have ever worked on. They take care of the tenth-splitting tolerances required by industry today. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines." These are the words of Herbert Harig, President (left above), and Karl Harig, Chairman (at right), Harig Manufacturing Corporation, Chicago, Illinois.

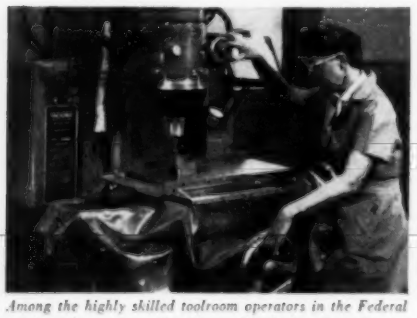
You will easily break the "tenth" barrier with this accurate machine. No gibs...no overhang...improved drive ...speed range of 60 to 2250 RPM...11 x 24" table working surface. It bores, drills, reams and spots holes in dies, jigs and production parts with unequalled speed and accuracy.

With this new, larger No. 3 model, you can grind—*with split-tenth* accuracy—holes plus regular and irregular contours to size and location after hardening. Faster strokes are provided for chop-grinding... infinite spindle speeds, 40 to 250 RPM...larger table working surface, 11 x 24".

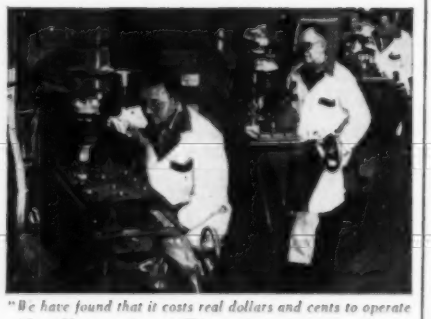
All hardened, ground and lapped ways. Made and calibrated to the new international inch.

Write today for literature describing the many advantages of the No. 3 Moore Jig Borers and Jig Grinders.

MOORE SPECIAL TOOL COMPANY, INC.
3100 Union Avenue, Bridgeport 7, Conn.



Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.



"We have found that it costs real dollars and cents to operate without Moore equipment. This cost factor is just one of many reasons why we recently added the new Moore Model No. 3 Jig Grinder. This Machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better." Statement by Val Koller, President, Koller Die & Tool Co., Milwaukee, Wisconsin.

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

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"Hereafter, Mr. Gordon, I'd suggest that you wear your face shield while you're grinding."

29. Buffing Speed Calculator. Hanson-Van Winkle-Munning Company has announced the availability of a handy 3" x 5" disc calculator for determining the surface speed of both buffing and polishing wheels. The calculator makes it easy to find, in surface feet per minute, the speed of any wheel from 1" to 60" in diameter, turning at spindle speeds from

(See Number 30)

220 to 20,000 rpm. Hanson-Van Winkle-Munning Company, Church Street, Matawan, New Jersey.

30. Formed Wheel Dresser. The Landis Bulletin TD-60 illustrates and describes the new Truform shake-free dresser. With this dresser it is said to be possible to dress a grinding wheel to the same shape as a profile bar without the necessity of honing or modifying the profile bar in any way to compensate for clearances found in sliding members of conventional dressing devices. Bulletin TD-60. Landis Tool Company, East Sixth Street, Waynesboro, Pennsylvania.

31. Miniaturization Awards Competition. An illustrated brochure containing the history and purposes of the Award, criteria used in judging, and information about entering the 1960 competition, which is sponsored by Miniature Precision Bearings, Inc., may be obtained from Horace D. Gilbert, chairman of the Miniature Awards Committee, Box 604, Keene, New Hampshire.

32. Precision Machining Service. A new brochure shows about a hundred typical items ground or otherwise machined to close tolerances, to illustrate the precision machining service offered by Retool Machine Co. on experimental, prototype and production items and parts for long or short runs.

100. Sam Safety Posters. A single copy of the current Sam Safety poster, or of any one of the fifteen which have preceded it, 8½" x 11", on 100# enamel, is available on request. Circle No. 100 on the Reader's Service Card. Nos. 1-11 (September, 1959,-July, 1960) are available immediately; Nos. 12-16, (August-December) will be available by January 1, 1961.

For large quantities, circle No. 100 on the Reader's Service Card, note on the bottom of the card the numbers and the months of publication of the posters you want, and enclose the card with a remittance according to the following schedule:

Up to 9 posters	.15 each
10-99 posters	.12 each
100 or more	.10 each

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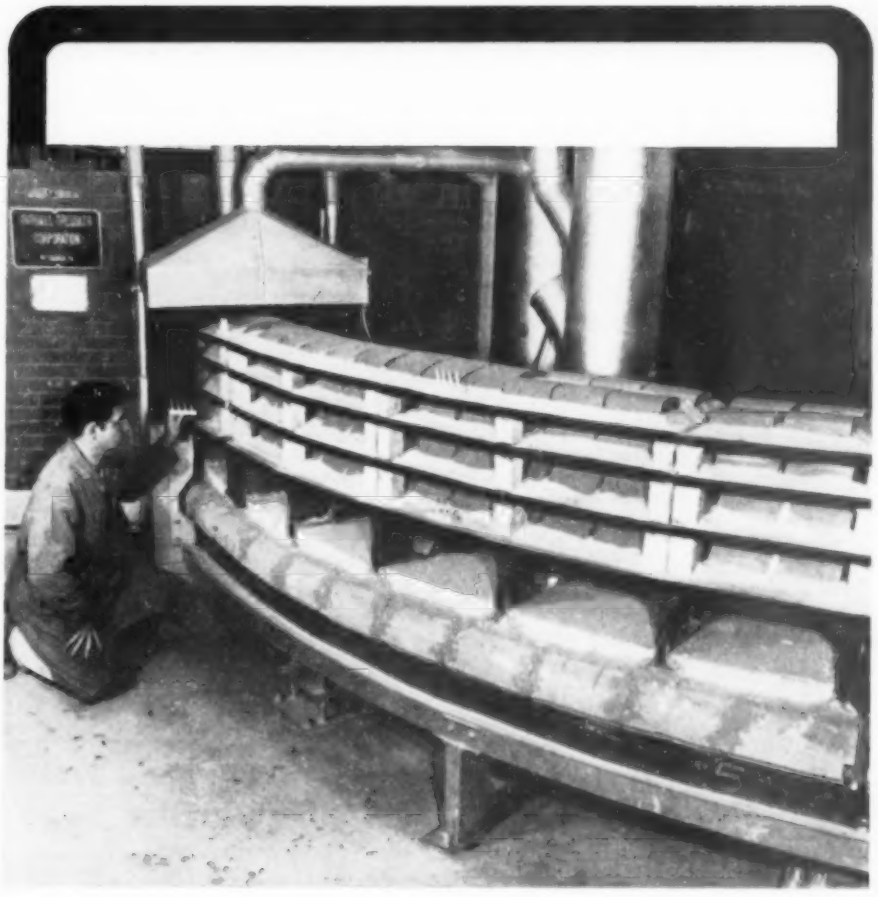

WHAT'S COOKIN'? FM SEGMENTS...

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Any time you really need urgent help, you can count on Fuller Merriam for 7-day delivery on top quality vitrified segments . . . **made to your order!** Or 14-day service under ordinary circumstances! Our 68-foot rotary tunnel kiln is one of the reasons why.

Automatically operated, this oil fired unit runs continuously, year in, year out at a constantly controlled 2300° F. There's never a shut-down for loading and unloading . . . for firing and cooling! Segments go through on a non-stop "train" that can cut delivery time by **weeks!**

The tunnel kiln is just one of many modern methods that mean fast FM service . . . and another unit in a step-by-step quality control program that gives you maximum precision on every grinding job.

If fast delivery and top quality are important to you, call your FM supplier today. Or send us your requirements! Standard specifications shipped from stock!

FREE grinding wheel selector on request.

THE FM

VITRIFIED
AND RESINOID
WHEELS
AND SEGMENTS!

FULLER MERRIAM CO. 72 Water St. West Haven, Conn. Telephone WEst 3-2501

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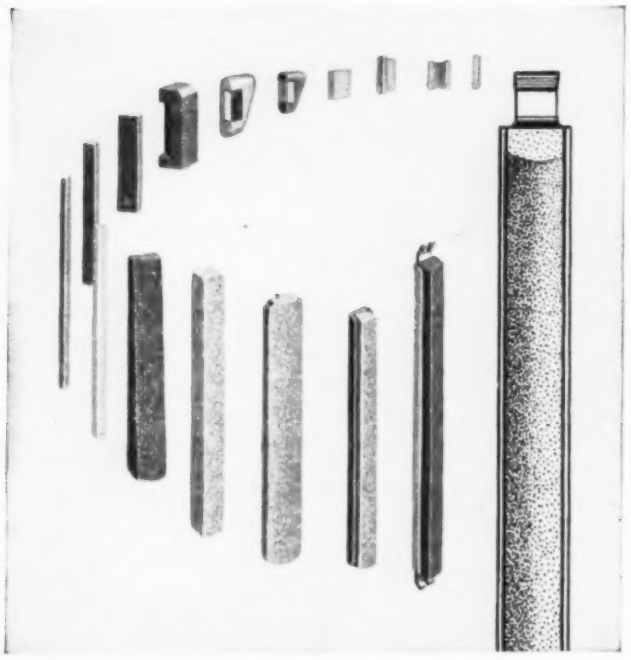
(Advertisement)

How uniformity in Honing Stones has been developed by the Micro-Bond Method

Not too many years ago, honing was a hit-or-miss operation and the production of a desired surface finish was a matter of chance, not skill. This situation was due to the variance in hardness of the honing stones. Stones supposedly identical in grade were found to be of varying grade. Since hones are generally used in "sets", it was entirely conceivable that one or more stones within a set could vary in hardness from the other stones within that set. Due to this difficult situation, it was almost impossible to predict what a stone or set of stones would do on any given operation.

Guess work had to be eliminated. The engineers at Mid-West Abrasive Company began working on honing stones that would have uniform grain, grade and dimension. They realized that if high production honing was ever to become a reality, the quality of such stones would have to be controlled to a fine degree. Through the research efforts of these engineers, the Micro Bond honing stone was developed.



This picture shows a number of sizes and shapes of honing stones that are used in a wide variety of honing operations.

HIGH PRODUCTION OBTAINED

Today, honing is a high production practice. It is more than a method of producing fine finishes; it will also remove stock faster than most other abrasive methods. While producing a finish having a micro inch root mean square reading of from 2 to 5, internal honing removes stock extremely fast, averaging .0007 to one cubic inch per minute in bore diameter four and one-half inches and over. A good rule of the thumb for stock removal ratio between abrasive and material removed is five to one. Five cubic inches of material can be removed with one cubic inch of abrasive.

Honing with Micro Bond stones has also proven highly successful in generating true holes, free from taper, out-of-roundness, and axial distortion. By using the proper stones, honing can finish a bore to extremely close tolerance, and at the same time will improve taper and out-of-roundness left in the bore by the previous operation.

WIDE RANGE OF GRIT AND GRADE

As with grinding wheels, the grain size determines whether a honing stone is best suited to "roughing" or "finishing", although there is a much more delicate line of demarcation between the two operations. For example: Operation "A" calls for removal of .015 inches of stock and a finish of 3 micro inches. That would require two stones, one for roughing (ranging from a 100 down to a 180 grit), and another for finishing (ranging from 400 down to 600 grit). The intermediate grits may be used for either roughing or finishing, or for both roughing and finishing, depending upon the stock removal and finish specifications of the job.

Operation "B" may be such a job. Instead of having to remove 15 thousandths inches, as was the case in operation "A", operation "B" calls for removing only 3 thousandths inches, and for finishing to only 6 micro inches. Operation "B", therefore, could be a one stone operation, calling for stones having grain ranging from 280 down to 320.

BEFORE DECIDING ON A PARTICULAR STONE

Determination of whether a given honing operation is a one stone or two stone job is one of six extremely important factors the operator must consider before deciding on the proper grain and grade for the job. The five remaining factors are:

1. The Rockwell hardness of the material being honed.
2. Metal specifications of the material.
3. The amount of stock to be removed.
4. The micro inch finish required.
5. Time allowed for the honing operation.

The work motions of honing stones are referred to as "feed" and "speed" or as "rotation" and "reciprocation". These movements result in a cross-hatched pattern that is controlled by adjustments in reciprocation and rotation to effect the desired functional finish.

The relationship between rotation and reciprocation in the honing of a bore is determined by the size of the bore, the hardness of the material being honed, and the type of finish desired. Speeds normally range from 100-200 SFPM.

HONING PRESSURES AND COOLANTS

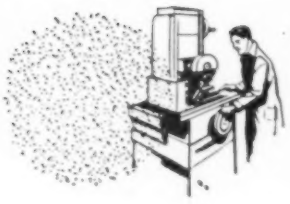
Two additional factors in honing must be considered. Both are very important. They are (a) pressure, and (b) coolants.

One of the fundamental facts of honing is that a given hone will remove stock faster from hard steels with light pressure and that in honing soft metals high pressure is generally required. Of course the pressure varies with the type, the heat treatment and other physical properties of the material being honed. The development in special coolants, in the past few years, has been extraordinary. Many companies are now producing standard ready mix coolants which readily are applied to any particular job. The Mid-West Abrasive Company's engineers are able to furnish recommendations on various coolants for jobs of almost any description.

Write Midwest Abrasive Company, Owosso, Michigan with your particular honing problem.

(Advertisement)

Use postpaid card. Circle No. 224



Equipment and Materials

Surface Grinder Uses Box Column, 125 Spindle HP To Increase Production, Accuracy

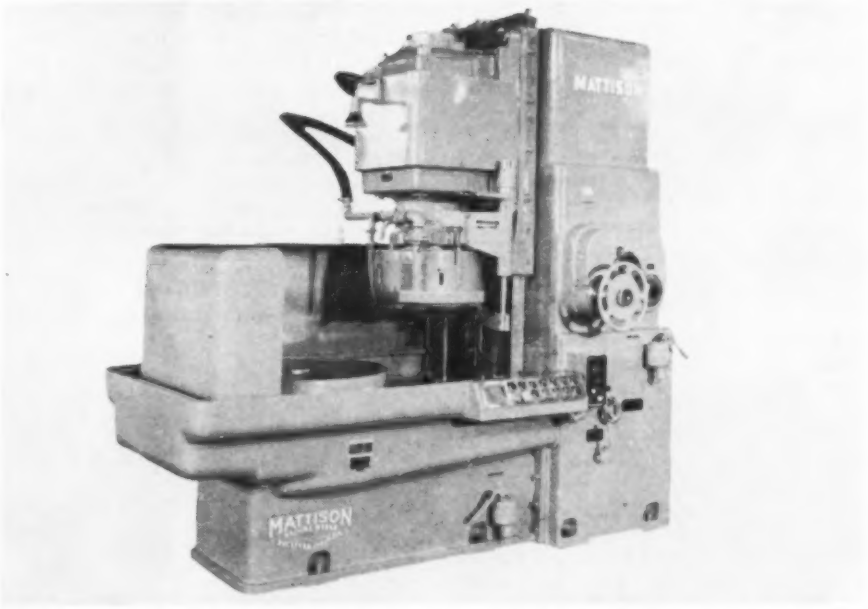
A one-piece, box-type column backs up spindle horsepowers as high as 125 on Mattison's new No. 24 vertical-spindle rotary surface grinder.

This new grinder with capacity up to 48" diameter combines Quick-Tilt grinding head with box-type column and increased horsepower. Accuracies measured in "tenths" are combined with high-production stock removal. On average grinding operations, productivity can be increased by 50%, or more, without sacrificing flatness or finish, according to the manufacturer.

The one-piece column is bolted and keyed to the base, forming the equivalent of a single "L"-shaped Meehanite casting. Grinding wheel thrust is down onto the table and back into the column. Deflection and vibration are virtually eliminated. Uniform cross-ribbing in the heavy, double-walled base provides rigid support under the table. Both bed and column are stress-relieved by heat treating. Resulting increased rigidity on a rough grind leaves less stock to remove during spark-out, normally the most inefficient part of the grinding cycle.

Power spindle tilting converts the No. 24 for roughing or finishing in a few seconds. Formerly, grinding for stock removal required lost time for manually adjusting the spindle, particularly when centering the work under the low point of the wheel's ellipse. Mattison's Quick-Tilt spindle solves this problem by using wheel tilt to rough grind parts to within a few thousandths of final size. Location of the low point has no effect on accuracy because, with a flip of the switch, the wheel is automatically returned to dead flat position for a finish grind without changing the setup. An air cylinder actuates the spindle-tilting mechanism.

The primary reason for increasing horsepower and rigidity is to take advantage of grinding wheel improvements. Increased bond strength and individually formed aluminum oxide grits



New Mattison No. 24 vertical-spindle rotary surface grinder combines increased rigidity with box-type column, up to 125 spindle horsepower, and Quick-Tilt grinding head. Tilted wheel rough grinds to thousandths of final size. Flip the switch and the wheel is dead flat for finish grind.

provide coarse, hard wheels capable of heavier cuts. High downfeed rates and bigger spindle motors increase unit pressures per grain—maintain free-cutting action and increase chip size. These wheels are self-dressing, so downtime normally required for dressing is eliminated.

Downfeed of the grinding wheel is continuous from .005" to .165" per minute. When work reaches desired size, the wheel disengages instantly by predetermined stop. Continuous downfeed makes it possible to split the last increment of a ratchet-type feed and increase accuracy. There is no limit to the feed rate because of linkage actuation.

A choice of automatic sizing systems is offered to control quality and cycle time. Both continuously measure piece-parts during the cut, with positive controls sensing actual size of work as it is ground. An air-gaging system provides visual and electrical indication when work approaches size. The electrical-mechanical system actuates the automatic cycle and returns the machine to reload condition when preset size is reached. By either method, operators can set maximum feed, then grind to size in one uninterrupted cut without miking.

To minimize thermal expansion and vibration which might affect accuracy of the grind, coolant is contained in a tank outside the base. This method also eliminates machine downtime to remove sludge from the base.

Newly matched to the increased rigidity and horsepower are cylinder

continued

wheel capacities to 22" x 4" x 18" and segmental wheel sizes to 22" x 6" x 19".

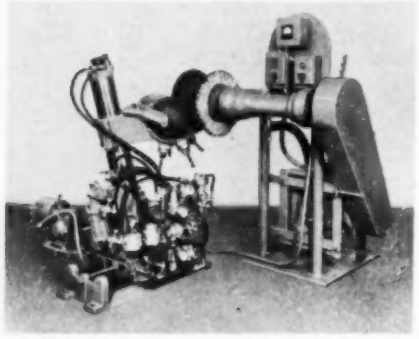
Increased minimum capacity for the coolant pump, from 50 to 75 gallons per minute, also keeps pace with higher grinding speeds available on the new No. 24.

The machine uses 30 in. through 42 in. magnetic chucks, with an alternate 48 in. swing available.

Mattison Machine Works, 545 Blackhawk Park Avenue, Rockford, Illinois.

Use postpaid card. Circle No. 41

Specialized Equipment Buffs and Polishes Spheres



Spherically-shaped products (such as bowling balls) which formerly required slow, awkward manual handling may now be economically and automatically finished with specialized equipment from Murray-Way Corporation.

This new equipment consists of a special automatic fixture machine which operates in conjunction with Murray-Way's standard L10 lathe with a shaped buff. By integrating work dwell time cycles, one man may operate several machines simultaneously.

The fixture machine has an oscillating motion which turns and spins the sphere as it comes in contact with the shaped buffing wheel. The sphere is carried through the cycle of position by automatic air controls and work dwell time is adjustable and non-electrical.

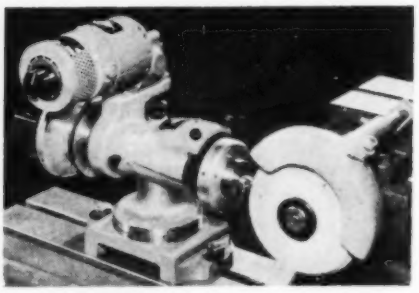
The work piece rides on protective finish pads which are easily adjustable for wear compensation, while the oscillation frame rides on lineal ball bearings, boot-protected, to provide the mechanism with frictionless long service life.

Manual screw adjustments position the machine for wheel wear and allow pre-setting the work up or down to proper buffing position. Positioning shafts are boot-protected from dirt, and the machine is equipped with an air pressure filter-lubricator for proper air control.

Murray-Way Corporation, P.O. Box 180, Birmingham, Michigan.

Use postpaid card. Circle No. 42

Fixture Provides Accurate Drill, Cam-Relief Grinding



A new dual-purpose grinding fixture for cam-relief grinding and high-precision drill point sharpening has just been announced by Harig-Steptool Co.

The manufacturer states that with this fixture, tool grinding departments can be equipped to do the most advanced, accurate grinding of drill points plus the simplest approach to cam-relief shaping and sharpening of a variety of tools. One cam is employed for right and left hand operation. It is infinitely adjustable and unlimited as to number of flutes. As a drill point grinder, range covers 128 sizes from No. 80 thru 1-1/32".

Harig-Steptool Co., 5757 W. Howard St., Chicago 48, Illinois.

(Harig-Steptool Co. is a new division of Harig Manufacturing Corp.)

Use postpaid card. Circle No. 43

Miniature Flap Wheel Finishes Tight Corners

A new, miniature flexible grinding wheel has been announced by Merit Products, Inc., Los Angeles manufacturer.

The small Grind-O-Flex is available in 2½ or 3 inches diameter. It can be used on fixed or portable shafts at speeds up to 15,000 rpm.

Constructed of scores of thin, flexible abrasive strips, the new miniature Grind-O-Flex comes in a variety of grits, for metal or plastic applications. Design of the wheel is such that fresh abrasive is constantly exposed as the wheel is used.

Useful for finishing tight corners and hard-to-reach places, the new Grind-O-Flex, smallest diameter flexible abrasive wheel of this nature manufactured, is adaptable to chucks or threaded spindles. It has all the features of the standard size Grind-O-Flex line, which is made in diameters up to 16 inches.

Merit Products, Inc., 3691 Lenawee Avenue, Los Angeles 16, California.

Use postpaid card. Circle No. 44

Re-designed Shaker Maintains Filter Efficiency

A significant improvement in their Dustkop shaker, for units equipped with a secondary bag-type filter has been announced by Aget Manufacturing Company. Formerly direct-acting, the new design is a lever-type shaker, which reduces manual effort and increases shaking efficiency.

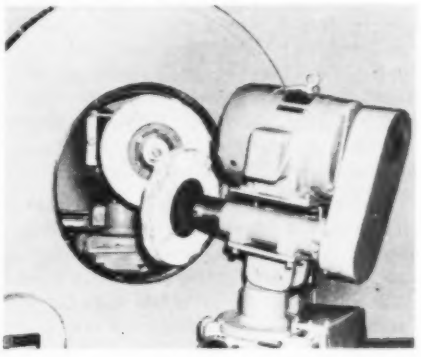
With its up-and-down action, this re-designed shaker is especially efficient in removing fine dust that formerly accumulated to plug the bag. Now, filtering efficiency is maintained indefinitely.

Because of the new shaking action, plus the Aget design feature of positioning the bag above, rather than at the side of the primary cyclone separator, it is no longer necessary to remove the bag to maintain peak dust collection and filtering performance.

Aget Manufacturing Company, 1314 East Church Street, Adrian, Michigan.

Use postpaid card. Circle No. 45

Semi-Automatic Unit Buffs, Polishes Wheel Rims



A new semi-automatic polishing and buffing machine for finishing bicycle wheel and similar rims has recently been developed by Acme Manufacturing Company.

Basically, the machine consists of a heavy duty rotating work holding fixture and two Acme L-8-L fully adjustable lathes.

The rotating work holding fixture consists of a series of clamping segments, actuated by an air operated scroll. This arrangement insures proper concentricity of part and adequate holding pressure.

Because of the heavy duty construction of the work holding fixture the lathes can be utilized for high pressure polishing or buffing operations to help reduce finishing time. Production rates can vary from 60 to 120 polished or buffed rims per hour depending on the specific application.

Each of the Acme lathes on this machine are equipped with manual adjustments to raise and lower and provide in and out positioning of the polishing or buffing wheels. In addition, a tilt adjustment for setting the

wheel spindle angle and a 360 degree horizontal swivel adjustment is provided on the heads.

A timer controlled air cylinder arrangement can be incorporated on this machine which could be pre-set for a desired finishing cycle time, thereby insuring uniform finish quality at maximum production rates.

The rotating work holding fixture is powered by a ¾ hp motor and the lathes are driven by 7½ hp motors.

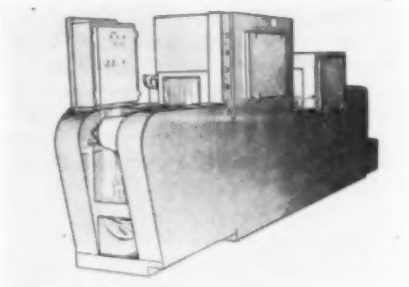
The Acme machine illustrated polishes and buffs wheel rims utilizing only two buffing lathes due to the specific rim configuration. The machine, however, is easily adapted to the use of three adjustable buffing lathes for polishing and buffing other wheel rim designs.

The machine occupies a floor space of approximately 6' x 6' and is 6' high.

Acme Manufacturing Company, 1400 East Nine Mile Road, Detroit 20, Mich.

Use postpaid card. Circle No. 46

Automatic Blasting Produces Varied Precision Finishes



The Hydra-Blast automatic precision finishing machine produces a variety of uniform and consistent precision finishes on eye glass frame pieces, jewelry, and other decorative articles, according to the manufacturer.

The unit also cleans, deburs, and descales hard-to-reach areas on aircraft, camera, electronic, instrument, and missile components, replacing tedious hand operations.

This wet blaster is made of stainless steel and uses a "Jeturbo" system in the blast circuit, from which pumps and moving parts have been eliminated.

Hydra-Blast Manufacturing Division, Automation Services, Inc., P.O. Box 5554, Fenkell Station, Detroit 38, Mich.

Use postpaid card. Circle No. 47

American Buff Develops "Golden Tacky" Treatment

After intensive research and field testing, American Buff Co. has developed a "Golden Tacky" buff treatment which, it is claimed, strengthens and conditions the buff, resulting in faster cutting, smoother finishing and increased compound-holding characteristics.

The new "Golden Tacky" treatment binds together the fibres of cotton or

Now you can settle out large particles from your mineral-type oil or water-soluble coolants—with new efficiency and economy. You get greater mileage from every gallon of coolant, increase tool life, and improve work quality.

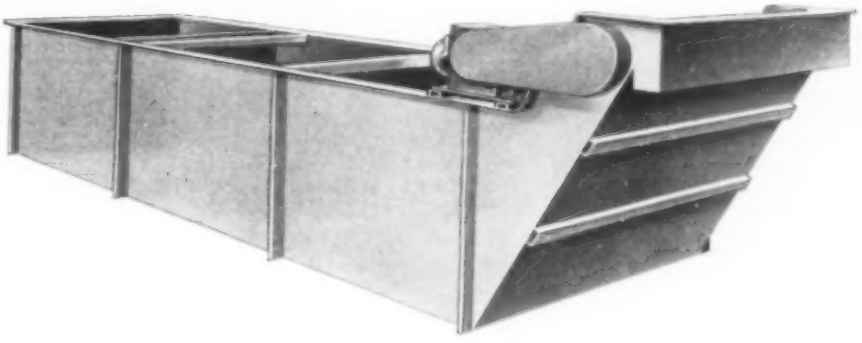
Olson's all-new Conveyorized Settling System makes the settling operation 70-90% efficient, depending on the viscosity of the coolant and size, weight, and nature of the contaminating particles. Operation is automatic from the start to the point of dropping sludge into the sludge disposal container. The system entails no servicing, such as adjusting or changing a filter medium. Only occasional emptying of the sludge pan is required.

The conveyor ramp can be built to extend upward to discharge at any height above floor level. Conveyor flights, chain and sprockets are made extra sturdy to handle the heaviest sludge load conceivable in a settling operation.

The Olson Conveyorized Settling System is available in tank sizes with holding capacities of 250 to 5000 gallons to suit your needs—whether applied to individual machines or central systems. For complete information, mail the coupon today.

ALL NEW

FROM OLSON



CONVEYORIZED

SETTLING SYSTEM

OLSON FILTRATION ENGINEERS *American Laundry Machinery Industries Division of McGraw-Edison Company, Cincinnati 12, Ohio*

OL-16-G

Send complete information on the all-new Olson Conveyorized Settling System.

*Name*_____

*Firm Name*_____

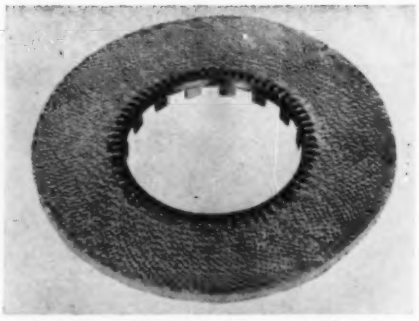
*Address*_____

*City*_____ *Zone*____ *State*_____

Use postpaid card. Circle No. 225

sisal buffs. It provides firmer body and eliminates loose, frayed fibre ends. Longer wearing and harder cutting, "Golden Tacky" treated buffs retain normal flexibility.

The new treatment substantially increases the buff's ability to hold compound and minimizes the buff cleaning problem. The result: better finishing and fewer passes, savings in materials, time and labor, longer buff life and more output per hour.



American Buff Company, 2414 S. LaSalle Street, Chicago 16, Ill.

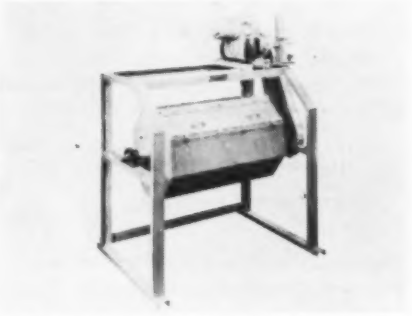
Use postpaid card. Circle No. 48

New Barrel Line Designed for Finishing, Definning

A line of 5 different models of barrel finishing units has been designed by Tumb-L-Matic, Inc., for the finishing and definning of both metal and plastic parts.

Designated as Type LS, the complete units incorporate barrels which range in size from 21" in diameter and 20" long to 30" in diameter and 48" long with either single or double compartments.

Type LS machines include, as standard equipment, welded channel iron framework, octagonal patented sheet steel barrels with hard maple liners, guarded chain drive, variable speed motor, unloading tray and screens and removable door with quick opening latches.



Optional equipment available includes loading hopper and unloading chute, expanded metal screen enclosure on both ends and rear, safety door providing limit switches interlocked with control system, magnetic brake on extended motor shaft and electrical push-button brake release.

The Type LS definning equipment for deflashing plastic parts is available in sizes, standard and optional features, identical to that of LS units designed for finishing metal parts. The barrels of LS definners, however, are furnished fabricated of 1/16" reinforced wire mesh providing 4 open squares to the square inch. Openings this size are said to be sufficiently large to allow flash particles to fall through. Other wire mesh sizes are available for special applications.

Tumb-L-Matic Type LS units can be fitted with a variety of drives to meet individual needs. The overhead type of motor mounting is standard. Parallel gear head motor of the fixed speed is also available in place of the standard variable speed and drive. Horsepower ratings range from ½" on the smallest (21" x 20") LS unit to 1 on the largest (30" x 48") unit.

Tumb-L-Matic, Inc., St. Mary's Street, Stamford, Connecticut.

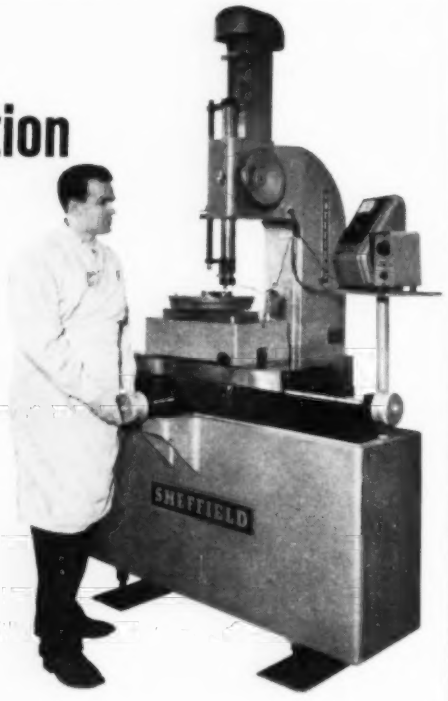
Use postpaid card. Circle No. 49

Height Gage Eliminates Need for Magnifying Glass

New Mueller hard chrome height gages have 50 widely spaced graduations which eliminate the need for a magnifying glass.

A specially designed friction roller unit is said to

Difficult hole location problems solved for short runs



At the Westinghouse Ordnance Plant, Lansdowne, Maryland, a Sheffield Coordinate Measuring Machine determines the true location of 18 holes in a magnesium integrator or gear box. Fifteen holes are checked to ±.00017; two holes to ±.00023; and 1 to ±.000075 (75 millionths).

Previous inspection with a height gage took two days and did not determine out-of-round condition. Sheffield reduced the time to six hours, checked for roundness, provided overall accuracy within .000075 on three axes.

Write for Catalog P-193 or call your Sheffield representative.

The SHEFFIELD Corporation Dayton 1, Ohio

A subsidiary of The Bendix Corporation

Inspection Gages, Dimensional Control Instruments, Machine Controls, Automatic Gaging & Assembly Systems, Measuray® X-Ray Thickness Measuring Crushtrue® & Multiform® Grinders, Cavitron® Ultrasonic Machine Tools, Press-Pacer® Transfer Units, Large Dies, Tooling, Contract Manufacturing

Use postpaid card. Circle No. 226

have eliminated backlash while setting the gage.

Gages come in inch and millimeter graduations.

Sizes available are 12", 18", 24", 36", and 48" lengths.

Mueller Gages Company, 1052-1058 North Allen Avenue, Pasadena, Calif.

Use postpaid card. Circle No. 50

Develop New Resinoid Bond for Thick Discs

A new resinoid bond developed by the Norton Company and designated as B14 is said to make possible thick discs which are more uniform, cut faster and cooler, and give more pieces per dressing than discs previously considered as standard.

Field testing extended over a period of two years on a nationwide basis, with B14 discs being tested on practically every type of disc grinder made . . . horizontal and vertical spindle, single and double spindle and on jobs ranging from rough grinding of castings to precision grinding with tenths of a thousandth of an inch accuracy.

Materials ground during these tests have included steels of all types and hardnesses, gray iron and nonferrous metals; also many nonmetallics such as ceramics and carbons.

Disc grinders and the abrasive discs used on them are available in many shapes and sizes and for use on an almost limitless number of applications. Norton B14 discs are available in the wide range needed for these operations.

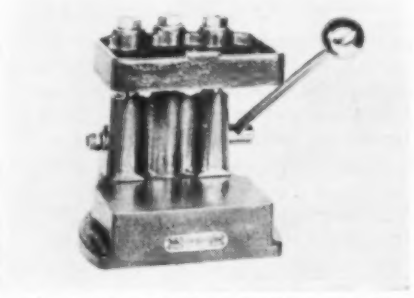
They are made with either aluminum oxide or silicon carbide abrasive in all their different types. They are made with inserted nuts or studs as required for mounting. The discs are available in plain types or with perforations for cool and free cutting if necessary. Discs with radial slots for better coolant distribution are available.

Zoned discs (discs with increasing hardness from center to periphery) are made in the larger sizes to maintain more uniform grinding action and disc thickness on work passing between the discs.

Norton Company, 1 New Bond Street, Worcester 6, Massachusetts.

Use postpaid card. Circle No. 51

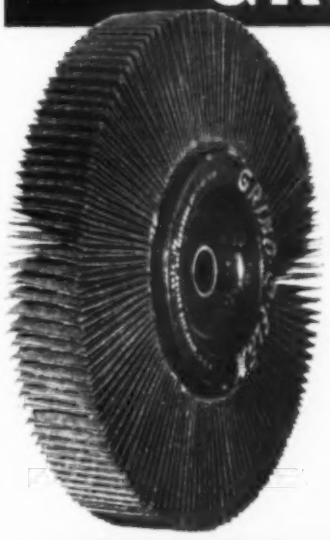
New Jig Makes Stock Area Range 2 to 48 Square Inches



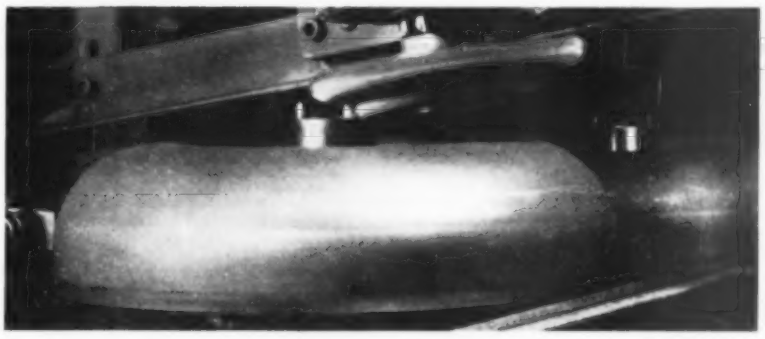
The N. A. Woodworth Company has announced the addition of a new size in their three-post "Cone-Lok" jig style No. 1 series.

continued

GRIND-O-FLEX



SLASHES PRODUCTION COSTS for BORG & BECK DIVISION BORG-WARNER



Here's your Production Problem:

The end of a Torque Converter Pump drive hub has two protruding milled tangs for driving the pump gear. The hub assembles through a babbitt bushing with the tangs engaging the gear. A smooth radius on hub ends and tang roots is essential, to prevent scratching the babbitt bushing.

Here's your Solution:

Today Borg & Beck Division of Borg-Warner Corp. employs a simple form of automation to replace the former sensitive hand polishing required to prepare the above described hub ends. The probing, resilient abrasive leaves of the Grind-O-Flex penetrate in and around the intricate surfaces, "wiping clean, bright and smooth." By the use of Grind-O-Flex wheels Borg & Beck were able to automate the job . . . due to the wheel's adaptability Borg & Beck have since applied it to two additional automotive torque converter lines, helping keep their cost competitive.

Grind-O-Flex, the original flexible abrasive wheel, will help you as it helped Borg & Beck, and many thousands of other enthusiastic steady customers. Wide range of grits, of diameters AND . . . Grind-O-Flex features lower first cost, lower operating cost, longer working life!

Write for full data and name of your nearest supplier.

MERIT PRODUCTS, INC.

first choice is always a product of Merit

3691 Lenawee Ave., Los Angeles 16, California

Use postpaid card. Circle No. 227

Two models are now available in 15 square inch work area jigs—one with 3" shut height, the other with 5" shut height. Model numbers are FC-1533 and FC-1535, respectively.

With the addition of the style No. 1 series, Woodworth can supply jigs from stock in work area sizes from 2 to 48 square inches.

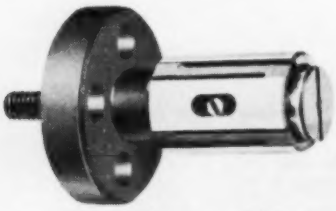
N. A. Woodworth Company, 1300 East Nine Mile Road, Detroit 20, Mich.

Use postpaid card. Circle No. 52

Bushing Gives Expanding Mandrel Unique Flexibility

A unique bushing with leaf spring action provides unusual flexibility for a new Balas expanding mandrel.

The construction permits the bushing to compensate for tapered holes, adjust to variations in hole sizes, and provide for equal chucking pressure at all points.



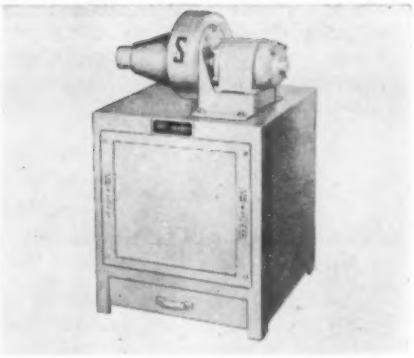
Capacities range from 7/16" to 11".

Balas Collet Manufacturing Company, 1557 East 27th Street, Cleveland 14, Ohio.

Use postpaid card. Circle No. 53

Claim 90% Efficiency for Dust Collecting Unit

New "Air-rester" dust collecting units, available in two sizes, average 90% efficiency in handling materials involved in grinding, polishing, and buffing, according to Standard Electrical Tool, the manufacturer.



Inexpensive replaceable filters are of adequate area to permit the maximum in arresting the finest of particles and releasing the cleaned air. With no special mounting required, both sizes use a maximum of 24" x 24" floor space.

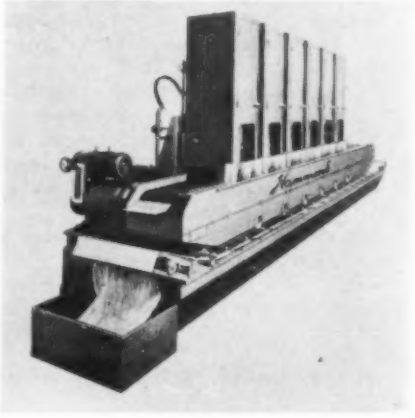
Model AR15, with a 1 hp motor, has a capacity of 850 cfm, while the AR16, with a 2 hp motor, provides 1470 cfm.

For applications on double-end grinders, buffers and similar units, two "Air-resters" mounted side-by-side permit each to be connected with and to serve only one wheel. Such a set-up delivers twice the capacity stated above.

The Standard Electrical Tool Co., 2488-96 River Road, Cincinnati 4, Ohio.

Use postpaid card. Circle No. 54

Automatic Belt Tracking Added on Flat Finishers



A new automatic air-actuated belt tracking and oscillation feature has been announced as available on all Hammond flat finishers.

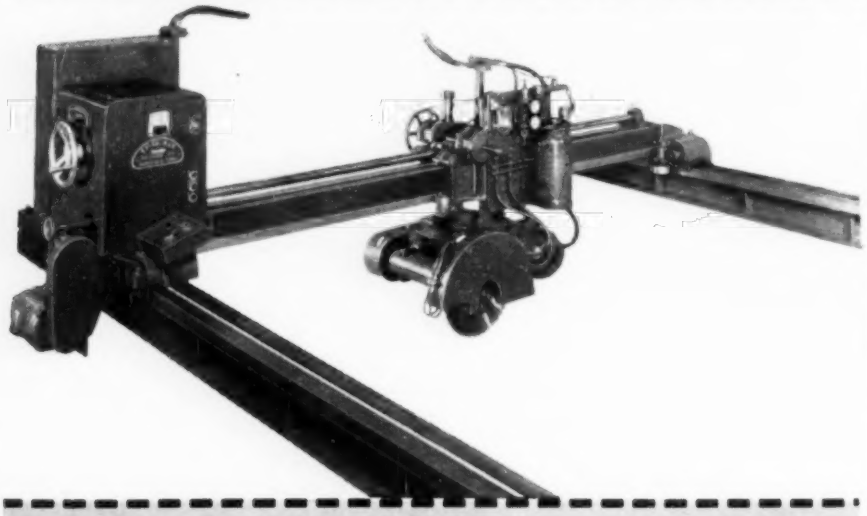
The device, according to the company, assures longer belt life, better finish, and substantial savings in labor. Once the tracking has been set, it requires no further attention from the operator until a new belt is installed.

Flat finishers are available with single or multiple heads and for abrasive belt widths of 6", 8", and 12". They are high production machines for the wet abrasive belt grinding, polishing, and deburring in one operation of flat work such as sheets, bars, strips, stampings, plates, extrusions, etc.

Hammond Machinery Builders, 1651 Douglas Avenue, Kalamazoo, Michigan.

Use postpaid card. Circle No. 55

ECONOMY SAW CUTS SHEET STOCK WITH 4-WAY ACTION



Accurate Squares up to 10 ft. Wide Any Length — Cuts Metal or Plastics

The new Ty-Sa-Man Economy "111-CX" produces accurate square rectangles up to any length, and up to 10 feet wide, from stock up to two inches thick. Motor and arbor travel on a transverse rail, which moves along two side rails. This four-way movement, in combination with the 90 degree swivel head, permits trimming all four sides of a plate without moving it. Handling time is reduced to a minimum.

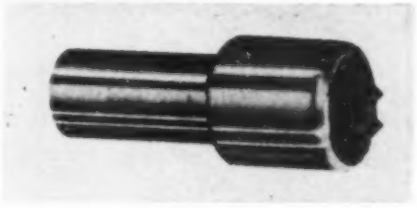
Ty-Sa-Man
SINCE 1885

Write for FREE BULLETIN

TY-SA-MAN Machine Co., Inc.
1016 White Ave., Knoxville, Tenn.

Use postpaid card. Circle No. 228

Masonry Saw Blades Use Tungsten Carbide Bond



A new series of diamond masonry and concrete saw blades from Diamond Tool Research provides Pressure-Tested diamond grits in a tungsten carbide bond.

Pressure-Tested diamond, according to the manufacturer, makes a significant difference in the ability of the blades to take heavier cuts and cut more footage than competitive blades.

The use of tungsten carbide as a bond is said to increase the efficiency of the blade by preventing the wearing away of the rim before the diamonds.

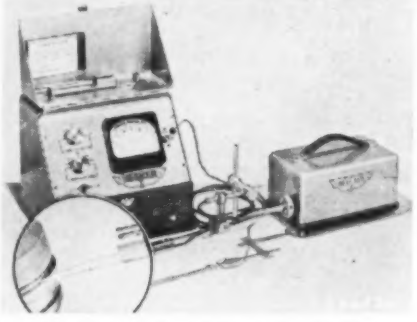
A special "raker" design built into the rim results in faster cutting and eliminates undercuttings by removing or "raking" out the chips of concrete.

There is no additional cost for Pressure-Tested diamonds. Blades are available in all standard diameters and thicknesses. Special sizes can be supplied.

Diamond Tool Research Co., Inc., 380 Second Avenue, New York 10, N.Y.

Use postpaid card. Circle No. 70

Minimum Clearance Adapter Measures Narrow Slot Finish



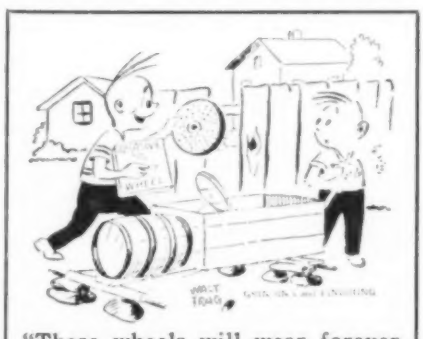
An adapter for the Surfindicator (a precision instrument for measuring surface finish) is used to measure the surface roughness of slots, bores, grooves and other surfaces which are inaccessible because of limited clearance. Designated Model BL-131, the adapter is designed as an accessory to the Brush general purpose pickup of the Brush Surfindicator BL-110.

The minimum clearance adapter can be inserted in a slot as narrow as 0.05-inch and as deep as 0.085-inch, and will measure surface irregularities within 0.010-inch of a shoulder. Where areas such as the surface in the side of a slot may be too small to accommodate the rider and the diamond stylus at the same time, the plane of the surface being measured can be extended by a jig. In such cases the rider and the diamond stylus could rest on different surfaces, but they would operate on the same plane.

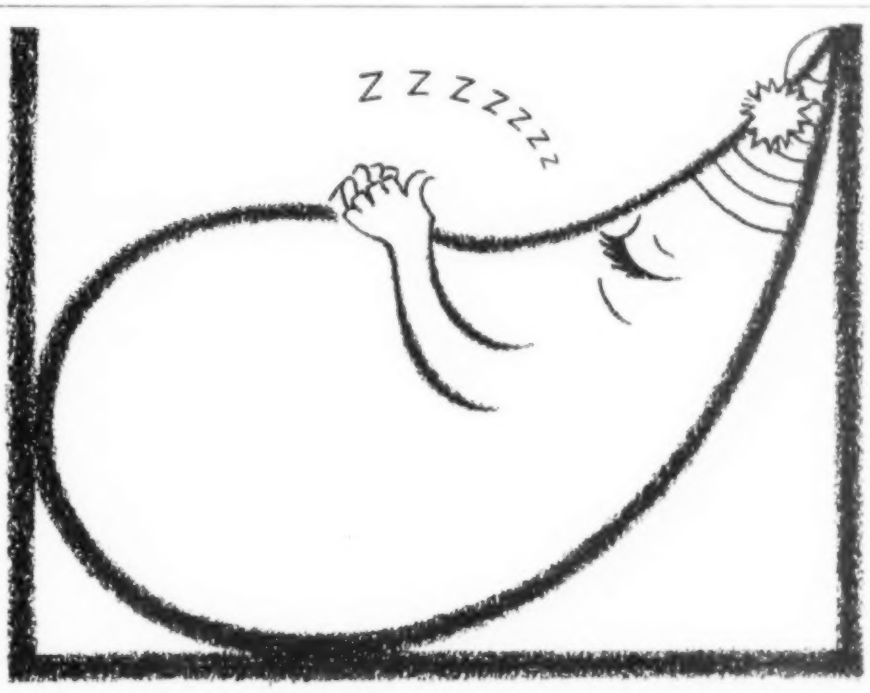
The Brush BL-132 adapter is recommended for use only with the Brush motor drive Model BL-114. Surface roughness can be measured in the range from zero to 250 microinches.

The adapter consists of an enclosed, precision-built extension which may be attached to the general purpose pickup in place of the three-position rider head with which it is equipped. Instrument calibration can be accomplished with the adapter attached to the pickup.

Equipped with a conical-shaped diamond point, the stylus exerts a maximum force of two grams. Radius of the diamond is 0.0005-inch. Radius of skid



"These wheels will wear forever . . . I found 'em in Dad's workshop."



Are you the victim of a lazy coolant?

Does your grinding coolant or oil just seem to lie there — making the rounds from tank to work — but without helping the wheel cut — without improving the work finish?

Is it sloppy about tolerances, chip-settling or rust? Does it smell bad?

If so, switch to a White & Bagley *lively* coolant! There's not a lazy molecule in a drumful!

W&B Chemical Concentrates—For very keen grinding action at very low cost.

W&B 1500 — for steel (and titanium)
W&B E-55 — for steel, cast iron, nonferrous metals.

W&B Lubricant 1888 — High-detergent oil-type soluble for better finishes, tolerances, on grinding *and* cutting.

W&B HD Soluble 2213 — Best combination of support and cooling for tough grinding and cutting jobs.

W&B Grinding Oil 1572 — Standard of the industry for extremely critical thread, gear, tap and form grinding.

To get the facts about *lively* coolants, write The White & Bagley Co., 88 Foster St., Worcester, Mass.

W&B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

Originators of Grinding Lubricants

Use postpaid card. Circle No. 229

is 0.012-inch. The rider of the minimum clearance adapter, located to the rear of the diamond stylus, is hard chrome plated to insure long wear. The stylus meets the requirements of the American Standard, "Surface Roughness, Waviness and Lay, ASA B46. 1-1955."

Brush Instruments, Division of Clevite Corporation, 37th and Perkins, Cleveland 14, Ohio.

Use postpaid card. Circle No. 71

Transistors Give Automatic Plunge, Internal Grind Control

Transistorized dimensional control units are now available for use with various types of gage tooling to provide automatic control of plunge cut and internal grinding operations. Four basic models by Federal Products Corporation are said to cover single- or double-limit control of I. D. or O. D. grinders.

According to the manufacturer, these units are capable of greater accuracy

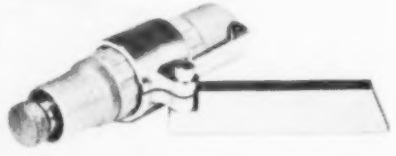
than competitive models and are much more compact, containing all the components formerly housed in these separate enclosures.

The use of transistors, instead of vacuum tubes, is not only responsible for the size reduction but has also improved reliability through longer operational life, lower power consumption and negligible heat generation. Each control unit is fail-safe both pneumatically and electrically. Loss of either air pressure or electrical power automatically retracts the grinding wheel. Each unit has built-in testing facilities to permit rapid tracing and isolation of trouble independent of machine operation.

Federal Products Corporation, 11060 Eddy Street, Providence 1, Rhode Island.

Use postpaid card. Circle No. 72

Swivel Arm Holder Aids Fast Air Tool Mounting



Dotco's new swivel-arm tool holder permits quick, easy mounting of Dotco Air Tools on any lathe, providing a wide range of work positions without changing the holder in the tool post, according to the manufacturer, Doeden Tool Corporation.

With its easy-lock ¼" socket-head cap screw, the operator can swivel the air tool through a 180° arc and can lock the air tool rigidly in one position.

Available in two sizes for Dotco Series 1 and Series 2 tools, this holder makes possible the use of high-speed Dotco air grinders and sanders directly on the lathe, thus adding versatility and productivity. Made of high alloy steel and chrome-plated, this tool holder requires only that the air tool be equipped with a push-pull sleeve valve to control its air supply.

Doeden Tool Corporation, Hicksville, Ohio.

Use postpaid card. Circle No. 73

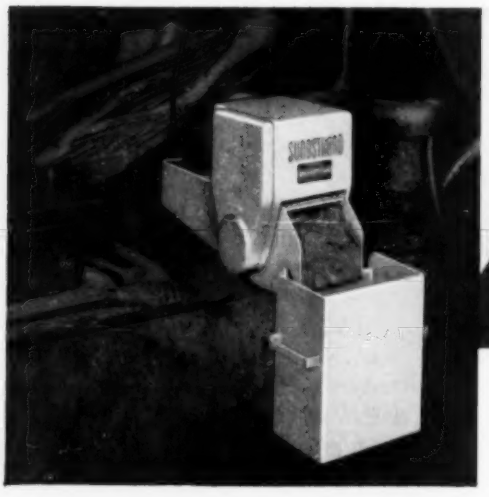
In no time at all, you can install a Sundstrand coolant separator

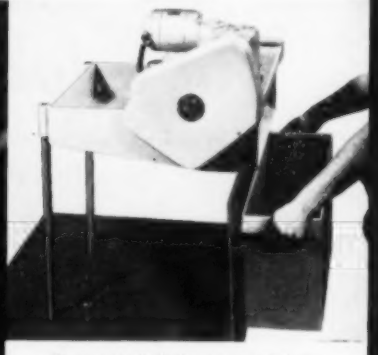
. . . to lengthen wheel life, improve finishes, reduce downtime, eliminate sump cleaning, and the number of coolant changes.

Installation is easy, separator can be placed right on open coolant tanks in most machines — no repiping or fitting necessary.

Maintenance is quick and easy. Separated material is deposited into a sludge pan which can easily be removed for cleaning in a few seconds, without any tools. No more sumps to be cleaned out.

You will save money and improve the quality of your grinding, honing, and gear shaving operations with Sundstrand magnetic coolant separators. They're available in four capacities: 25, 50, 75, and 100 gpm.





Permanent alnico magnet drum revolves against coolant flow — attracts and separates magnetic particles quickly and easily. Sludge pan is removed in a few seconds.

Bulletin A368 gives complete data. Write for your copy today.

MARK OF RELY-ABILITY

SUNDSTRAND POWER-GRIP

SUNDSTRAND-AMERICAN BROACH
ANN ARBOR, MICHIGAN
Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 230

Electronic Device Protects Grinders Against Vibration

A versatile new electronic device for protecting equipment and processes against damage from excessive vibration has been announced by the Industrial Balancer Department of Stewart-Warner Corporation. It is sensitive to vibrations as minuscule as two-millionths of an inch amplitude, the manufacturer states.

The device is described as a resonance-type vibration monitor. It stands sentinel on the machine, grinding wheel, or other equipment which it is set to monitor—flashing a signal or stopping the machine if safe limits of vibration amplitude are exceeded. It also becomes, with an accessory plug-in attachment, a portable balancer to be used in correcting the condition creating the vibration. The unbalanced, vibrating part can be corrected, in place and at once, in most cases.

Manufacturers of grinding machines can add the new device as standard equipment to keep wheel vibration down to acceptable levels so that finer finishes and tolerances can be obtained.

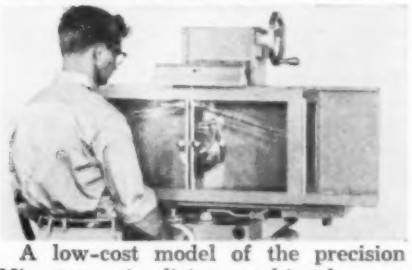
The operator would be warned before the grinding cut was taken whenever the required finish was not obtainable due to presence of excessive vibration, thereby saving the workpiece. With the balancing accessory, the grinding wheel (or any other machine part) could then be precision-balanced quickly and effectively.

Stewart-Warner Corporation, 1826 Diversey Parkway, Chicago 14, Ill.

Use postpaid card. Circle No. 74

"Here . . . expert on volumetric grinding costs! How about reducing some of these volumetric food costs?"

Economy Model Slicer Cuts Semiconductors



A low-cost model of the precision Microtom-atic slicing machine has recently been announced by the DoALL Company. This is the MTM-612, designed for more productive slicing of silicon, germanium, quartz, ceramics, ferrites, and carbides.

The machine has a 6" x 12" table area, 12½" table traverse, 6" cross-feed and many of the features of the larger Microtom-atic machines. Among these features are precision spindles and automatic lubrication, drive and coolant systems.

Exceedingly thin diamond cutting wheels are driven without vibration by a precision spindle and flat belt drive. The same heavy-duty, precision spindle, drive and motor of the larger Microtom-atic machines also are used in the low-cost MTM-612. It also has hydraulic table traverse and manually operated cross-feed.

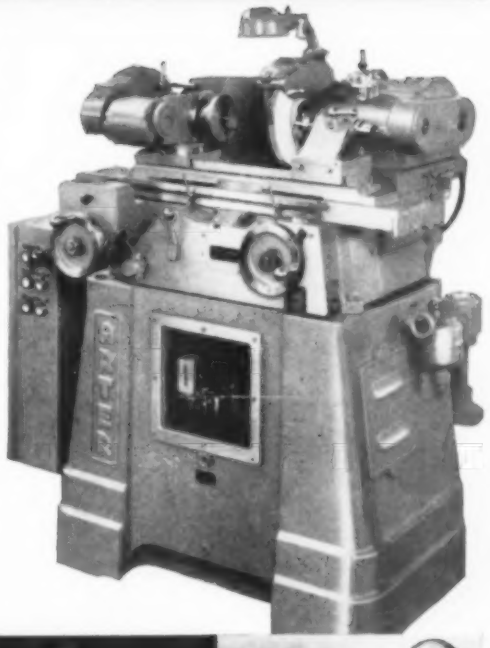
The DoALL Company, 245 North Laurel Avenue, Des Plaines, Illinois.

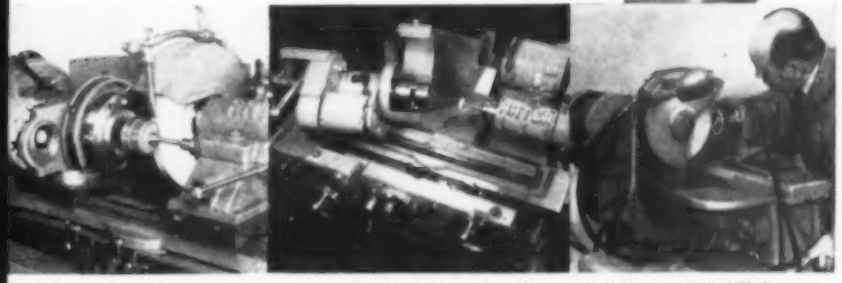
Use postpaid card. Circle No. 75

Best buy for toolroom or small-capacity production grinding

The Sundstrand-Arter Model 103 can be arranged for cylindrical or internal grinding. Wheel heads swivel 15 degrees either side of center — work head swivels 90 degrees. It's ideal for toolroom or production work where a small-capacity machine is needed, or for supplementing larger grinders when work piles up. Multiple-jaw chucks, faceplates, and other chucking accessories can be quickly attached to spindle nose.

Sundstrand-built to highest precision standards, this moderately priced grinder has a complete hydraulic movement of table and wheel head. Maximum capacities: external—3" OD, internal—3" ID.





Wheel and work head arranged to grind cylindrical work.

Internal grinding head with work head swiveled.

Work head swiveled 90 degrees to grind a gear shaper cutter.

For complete information, write for Bulletin 918.

MARK OF RELY-ABILITY

SUNDSTRAND ARTER

SUNDSTRAND MACHINE TOOL

BELVIDERE, ILLINOIS

Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 231

Claim New Power Brush Concept; Different Action

With the introduction of their Master Blend wire brushes, the Osborn Manufacturing Company claims to have ushered in a totally new concept in power brushing, with better control of the cutting action and closely matched edge blends.

Peening or rolling of metal edges, it is said, is kept to a minimum, and in many cases is completely eliminated. Edge blends can be held to close tolerances, making possible the production finishing of parts requiring an .005" edge blend.

The new tools, blended straight wire points coated with a plastic bond to control finishing action, are available in wheel diameters from 4" to 12".

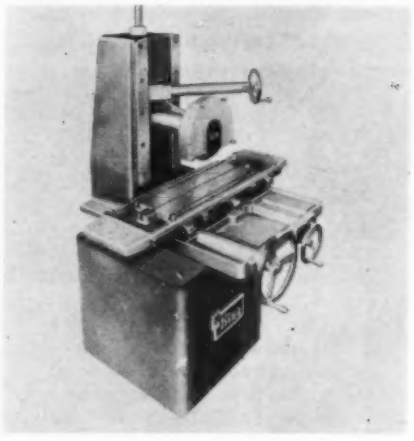
Originally designed for use on Osborn metal finishing machines, they are reported highly effective on other types of polishing lathes, rotary indexing machines, and similar equipment.

It is expected that the new tools will see extensive service in a wide range of operations removing burrs and blending edges of ferrous and non-ferrous fine pitch gears, removing flash of plastic parts, producing close tolerance edge blends on clad metal products, and burr removal and edge blending of powdered metal parts. In many instances, the new tools will replace finishing operations which formerly required the use of hard-to-remove deburring compounds.

The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.

Use postpaid card. Circle No. 76

King Machine, LA, Brings Out Low-Cost Surface Grinder



King Machine & Mfg. Co., Los Angeles machine tool manufacturer, is now marketing a newly developed manual-control surface grinder, model K-1020. It is described as an "extra-capacity, low cost precision grinder."

For either wet or dry grinding, the model K-1020 has a longitudinal table travel of 20 inches, and a 14 inch cross feed. Grinding wheel diameter of 12 inches allows a 15 inch vertical clearance over the table.

The tee-slotted table travels on precision ground ways and has adjustable table stops. It features a 10" x 20" working surface when used for wet grinding.

The King grinder has a direct-drive spindle, rotating on pre-loaded precision ball bearings, powered by a 1½ h.p. balanced motor. Magnetic chucks and other accessories are also available.

King Machine & Mfg. Co., 1171 East 32nd Street, Los Angeles 11, California.

Use postpaid card. Circle No. 77

Honing, Superfinishing Fluid Safe at High Temperatures

Because it has a flash point of 275° F, Shear-Speed Formula 50 meets the honing-fluid safety requirements of most major American production plants, according to the manufacturer. Stock removal rates as high as those with straight kerosene have also been reported.

Formula 50 can be used with all types of honing and Superfinishing machines. Non-sulphurized, it can be used for finishing most metals. The fluid has

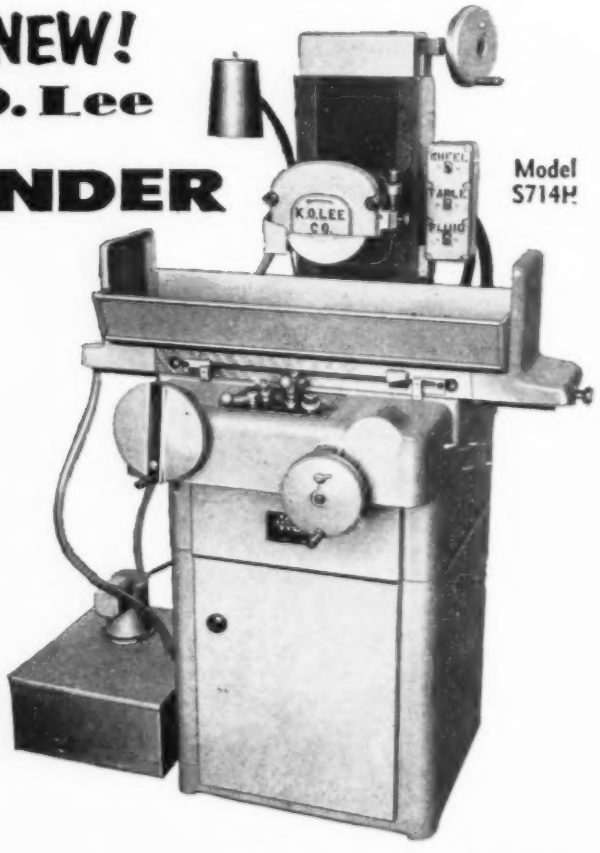
Announcing the NEW! K.O. Lee SURFACE GRINDER Model S714H

features:

- ★ A low cost precision grinder designed to handle most of the work ordinarily done on larger machines.
- ★ Spindle has duplex pre-loaded heavy duty ball bearings on each end. Spindle is driven with O-ring type belts for smooth operation.
- ★ Heavy cast iron construction throughout.
- ★ Extra length V and flat table ways distribute weight over greatest practical area for maximum table support and permanent accuracy.
- ★ Table Ways are continuously lubricated, a definite improvement over the manual system.

Finest accuracy and micro-finish obtainable.

WRITE FOR COMPLETE LITERATURE



K.O. Lee Company, Aberdeen, S.D.

Use postpaid card. Circle No. 232

good solvency and is said to keep honing stones clean and free cutting.

PROPERTIES

Viscosity:	44-48 SSU @ 100° F
Fat:	None
Sulphur:	None
Chlorine:	Present
Color:	Blue (identification dye)
Flash:	275° F, C.O.C.
Fire:	295° F, C.O.C.

Shear-Speed Chemical Products, Div. Michigan Tool Company, 7125 McNichols Road, Detroit 12, Michigan.

Use postpaid card. Circle No. 78

Expand Diamond Grinding Pin O. D. Range to .2—.5"

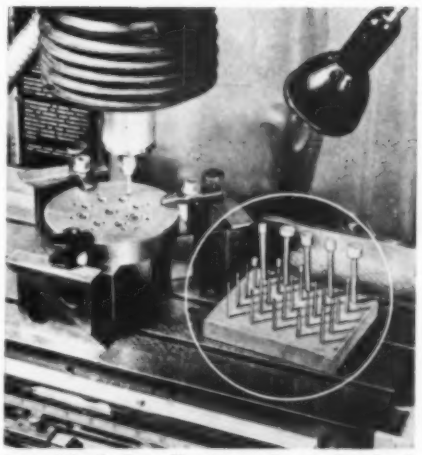
Titan Tool Supply's line of diamond grinding pins has been expanded to include 25 different sizes in a range from 0.20" diameter to 0.500".

With pins in the smaller sizes available in 0.010" intervals, jig grinding and internal grinding of small holes are said to be greatly simplified.

Such a close range permits the use of maximum size shaft, insuring greater accuracy by minimizing the possibility of whip and shaft run-out.

All 25 sizes are now available in two grit sizes. The larger 80/100 grit, far coarser than that normally available, is ideally suited to applications where rapid cutting action and greater production is desired.

The trade standard 200/240 grit is also available where finished quality



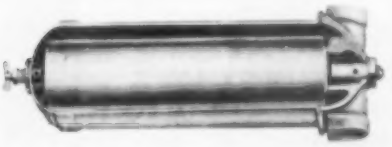
is critical. In all sizes, the individual grains are especially graded to insure uniform size. Thus, with standard 100% diamond concentration, you are assured complete cutting action of all the particles. The diamond grains are permanently bonded to harden tool steel shafts by an exclusive "Chrome-Lok" process to assure maximum service life and economy.

Titan diamond pins are available in cylindrical shapes as shown in the attached photograph from sizes of 0.20 diameter to 0.500. For pins which are smaller than the ⅛" shank this shaft is undercut to provide adequate clearance.

Titan Tool Supply Co., Inc., Box K, 1419 Hertel Avenue, Buffalo 16, N.Y.

Use postpaid card. Circle No. 79

Porous Metal Element Filters Corrosive Fluids



Commercial Filters Corporation has developed a sintered 316 stainless steel filter element adaptable to any CFC Fulflo filter.

The CFC porous metal element is designed for the filtration of fluids with characteristics incompatible with ordinary filter media, particularly corrosive, high temperature and high viscosity fluids.

CFC porous metal elements are available in 40, 20, 10, 5, and 2 micron particle-retention ratings.

Corrosion-resistant, they are said to be free from media migration under high differential pressures, vibration, or thermal shock.

A large percentage of voids in the elements provides high dirt-holding capacity and economic flow rates with high-viscosity liquids.

These filters can be cleaned by firing, by chemical or ultrasonic treatment, or by back flushing.

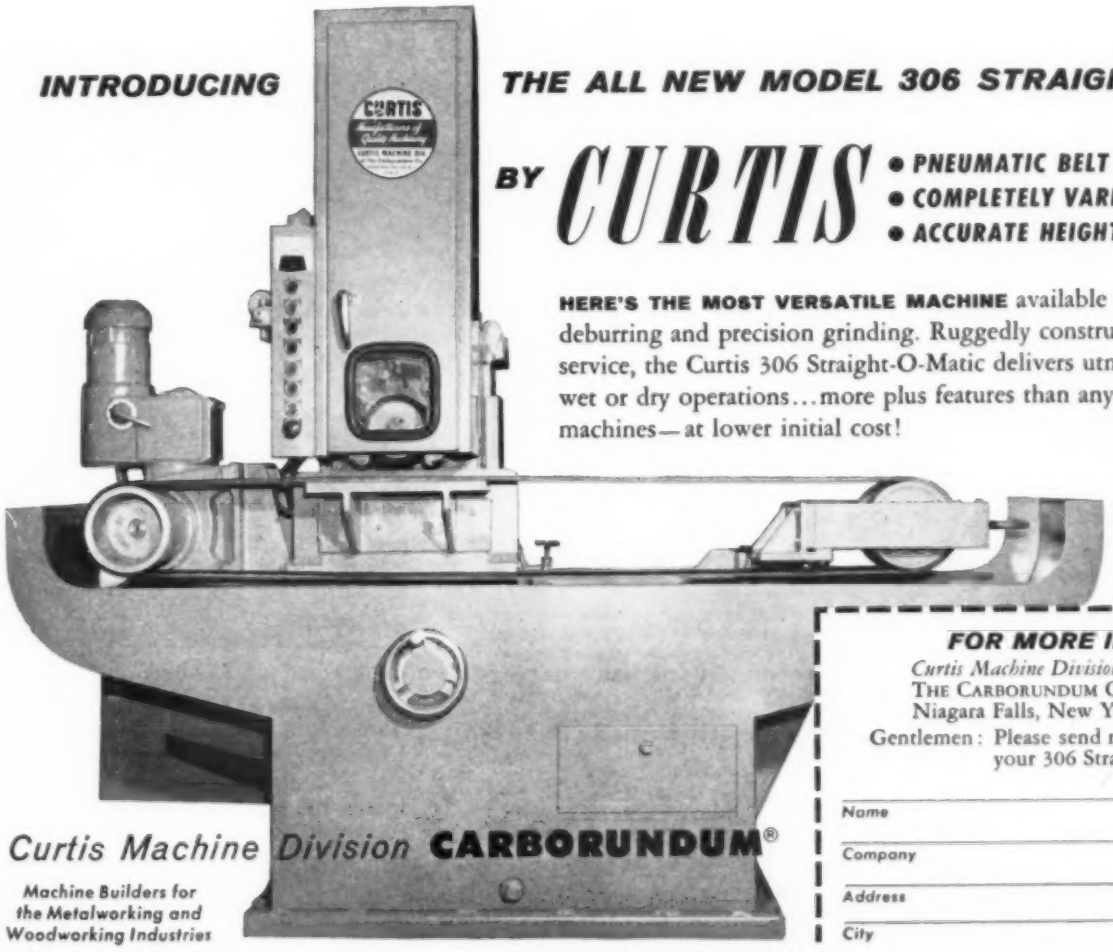
Commercial Filters Corporation, 2 Main Street, Melrose 76, Mass.

Use postpaid card. Circle No. 80

INTRODUCING THE ALL NEW MODEL 306 STRAIGHT-O-MATIC

BY CURTIS

- PNEUMATIC BELT TENSIONING
- COMPLETELY VARIABLE BELT SPEED
- ACCURATE HEIGHT ADJUSTMENT



HERE'S THE MOST VERSATILE MACHINE available today for polishing, deburring and precision grinding. Ruggedly constructed for long service, the Curtis 306 Straight-O-Matic delivers utmost precision on wet or dry operations...more plus features than any competitive machines—at lower initial cost!

Curtis Machine Division CARBORUNDUM®

Machine Builders for the Metalworking and Woodworking Industries

FOR MORE INFORMATION

Curtis Machine Division
THE CARBORUNDUM COMPANY, Dept. GF
Niagara Falls, New York

Gentlemen: Please send me more details on your 306 Straight-O-Matic.

Name

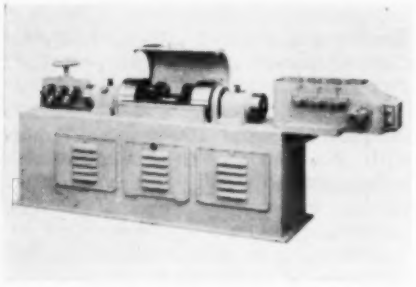
Company

Address

City Zone State

Use postpaid card. Circle No. 233

Mechanical Rod Descaler Designed for Stainless, Alloys



The new Salvi mechanical descaler with double planetary gear has been specifically designed for the processing of stainless steel, alloy, and high carbon rods.

Heretofore, mechanical descalers were successful only if used in connection with mild steel rod, but with the introduction of this new unit, mechanical rod descaling can now be successfully extended to the stainless steel, high carbon and alloy steel industries.

Not only is the scale broken and brushed clean by its double planetary gear brush system, but the machine is so designed that it can be used to get the first draw with the water cooled drawing die holder built into the forced lubrication box.

As with all Salvi mechanical descalers, no acids are used. It completely does away with the sometimes difficult problem of acid waste disposal.

Straus-Artys Corp., 45 No. Station Plaza, Great Neck, New York.

Use postpaid card. Circle No. 81

Safety Glasses Engineered for Better Protection

A new line of six basic models of safety glasses is being introduced to industry by the American Optical Company's Safety Products Division.

Called the Durasafe line, these safety glasses will be offered in six basic colors—smoke, pink crystal, mahogany, two-tone smoke on crystal, two-tone mahogany on crystal and two-tone black on crystal.

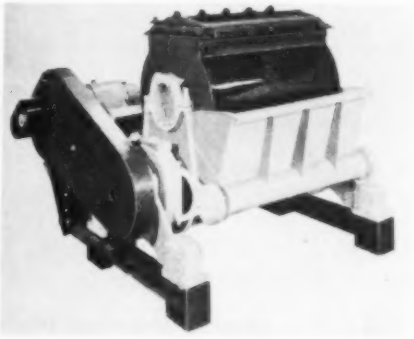
The Durasafe line is engineered for greater safety and designed so workers will wear them more willingly on the job. Durasafe provides a complete range of bridge and eye sizes to fit everybody—with and without side shields.

A new wider temple comes in anodized aluminum, solid color plastic spatula and plastic comfort cable.

American Optical Company, 81 Mechanic Street, Southbridge, Mass.

Use postpaid card. Circle No. 82

Vibratory Finisher Line Boasts Interchangeable Drums



Designed to provide deburring, descaling, burnishing and coloring operations for virtually every size and shape part without marring or distortion, Selectro Vibro Finishers (Productive Equipment Corporation) deburr, descale and finish inside surface and hard-to-get-at areas regardless of size of openings.

Selectro Vibro-Finisher's drums are easily interchangeable and are available in a variety of sizes, including multiple sectional drums for different types of material, requiring different media and finishing time, in the same operation. Vibrating mechanism is positive eccentric with adjustable stroke instead of the unbalanced pulley (offset weight) method. This greatly reduces the power needed for operation.

Selectro Vibro-Finishers reduce the finishing time cycle up to 1/10th of normal tumbling time and finish nearly twice as many parts per cycle. Rubbing action instead of tumbling eliminates distortion of even the thinnest parts . . . no nicking, marring or scratching . . . parts may be dumped into drum loose with media or fixtured on drum or outside rack.

Productive Equipment Corp., 2926 West Lake Street, Chicago 12, Ill.

Use postpaid card. Circle No. 83

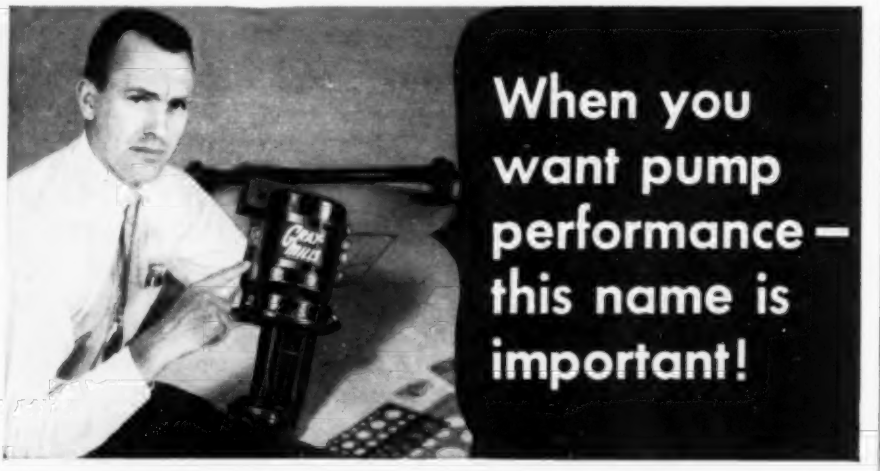
Plastic Scoop Handles Grain, Media, Powders

A newly-designed plastic two-quart scoop is made of polyethylene, a strong, clean, durable plastic which is not affected by common grain or chemicals.

It is recommended by the manufacturer for handling tumbling media, chips, abrasive grain, metal finishing powders, and similar materials.

Gracox, Incorporated, Dept. 8, 162 Colgate Avenue, Buffalo 20, New York.

Use postpaid card. Circle No. 84



GRAYMILLS *Superflo*
COOLANT PUMPS

Thousands of GRAYMILLS Centrifugal Superflo Pumps have been installed as original equipment; and thousands more are in use as conversion or replacement units. In addition to continuous use for pumping coolants, they've been used to pump abrasive slurries, ground glass, lens polishing rouge, enamels, lacquers and degreasing solvents. Over millions of hours of operation, the name GRAYMILLS has become synonymous with pumping performance. Available in 36 standard models completely interchangeable with other makes. Don't replace trouble with trouble . . . put a GRAYMILLS Coolant Pump on your machine and *relax!* They're sold by leading industrial distributors everywhere. Write for complete catalog—No. 56R

GRAY-MILLS

GRAYMILLS CORPORATION

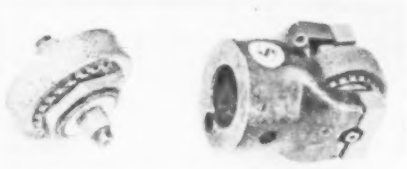
3727 N. LINCOLN AVE. • CHICAGO 13, ILLINOIS

Eastern Div.—1122 Hamilton St., Allentown, Pa. • Western Div.—4312 W. Pico Blvd., Los Angeles 19, Calif.

DESIGNED AND PRICED FOR MACHINE BUILDERS USE

Use postpaid card. Circle No. 234

Power-Driven Tool Dresses Wheels Fast, Accurately



The Sidley diamond Crushcutter traverse dressing tool consists of an alloy wheel into which are set many diamonds in rows across the periphery.

Power-driven and electronically controlled with stepless speed variations, it is designed to dress all kinds of wheels on any kind of operation.

It has been reported that the combination rotary and traversing action of the Crushcutter enables the user to dress wheels faster and more accurately, with less friction.

Sidley Diamond Tool Co., 26045 West 7 Mile Road, Detroit 40, Michigan.

Use postpaid card. Circle No. 85

Grinding Concentrate Improves Machining Oil Performance

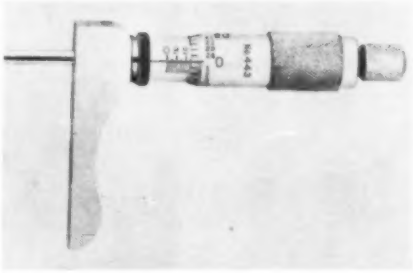
Diversified extreme pressure agents in a new machining and grinding concentrate are reported to increase both feeds and speeds as much as 30%, while simultaneously improving tool life and producing better parts finish of ferrous alloys.

The concentrate, No. 217-B, is recommended as a fortifying agent for grinding, cutting, tapping and drawing oils. Dilution is one part concentrate with 10 parts of 90-150 second pale oil.

Baker/Gubbins Company, 1448 Wabash Avenue, Detroit 16, Michigan.

Use postpaid card. Circle No. 86

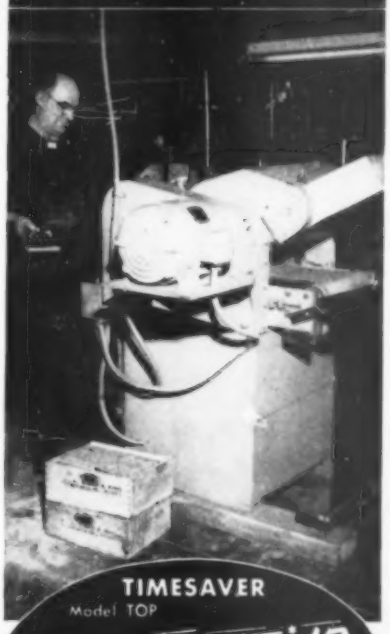
Depth Gage with Half Base Aids Gaging Near Shoulders



A new series of micrometer depth gages introduced by The L. S. Starrett Company features a short half base designed to facilitate depth gaging close to shoulders or between obstructions where ordinary full base gages will not go. They are available in three size ranges—0 to 3 inches with three rods, 0 to 6 inches with six rods or 0 to 9 inches with nine rods.

Sleeve and thimble on these No. 443 series micrometer depth gages have

"650 metal stampings deburred in 10 minutes"



TIMESAVER
Model TOP
SPEEDBELT 12
ABRASIVE BELT SANDER

V. A. BOKER & SONS, Minneapolis, Minn., manufacturer of precision metal stampings reports:

"We processed 675 metal stampings using a Speedbelt 12 and 2 men in 1 hr. 40 mins. or 3 hrs. 20 mins. of direct labor charged against the job. By old deburring methods this run would have taken in excess of 20 hours. Another run of 650 metal stampings was completed in 10 mins., or 20 mins. direct labor compared to 4 hrs. by former deburring methods. These runs are typical of the savings in production time we have made on this type of work. We also find we are achieving a much better finish as well."

TIMESAVER "SPEEDBELT" SANDERS CAN HELP CUT YOUR PRODUCTION COSTS . . . TOO!

V. A. Boker & Sons' experience is typical of the many installations where versatile, low-cost Timesaver "Speedbelt" Sanders have replaced slow, costly deburring, finishing and polishing methods. Timesaver Sanders are built in 12", 18", 24", 38", 50" and 54" models . . . a size and type to solve most polishing, finishing and deburring operations on solid or perforated aluminum, stainless steel and other metal sheets, bars and blanks.

INVESTIGATE the advantages of these amazing machines and hi-speed abrasive belt operations for your shop. Write for literature today

TIMESAVER SANDERS
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Dept. R-10

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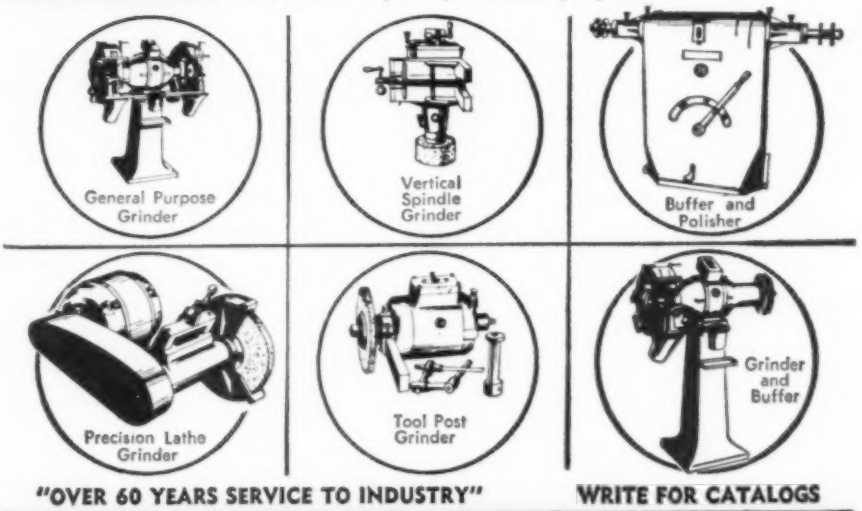
The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY
UNITED STATES ELECTRICAL
GRINDERS-BUFFERS

An investment in better, faster, production through the use of tools expertly designed and conscientiously crafted for your particular purpose.



"OVER 60 YEARS SERVICE TO INDUSTRY" WRITE FOR CATALOGS

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

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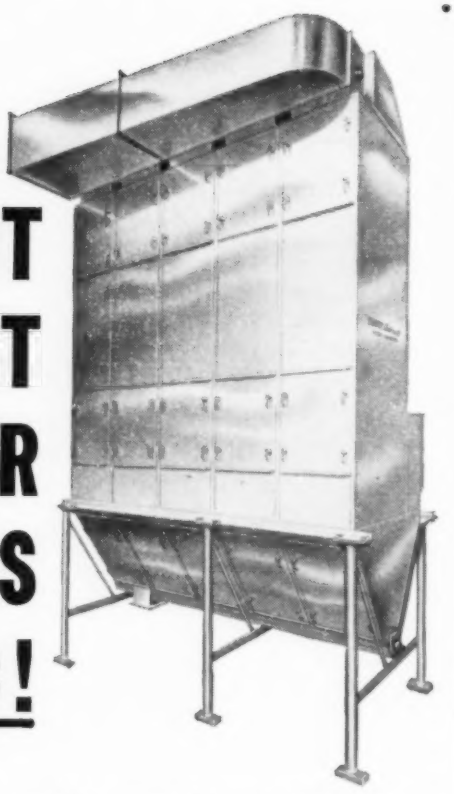
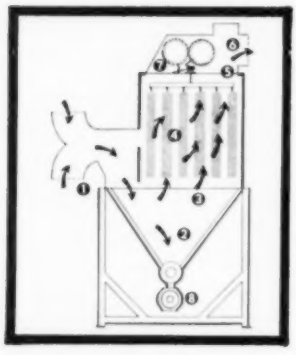
NEW TORIT DUST COLLECTOR IS AUTOMATIC!



Save real dollars with the benefits from this *automatic* dust collector. No more interruptions on production lines! Maintenance problems are practically eliminated. This all new continuously cycling TORIT dust collector *automatically* cleans your air and *automatically* shakes its own filters and blows them clean with reverse air flow. Collected material is emptied *automatically*.

OTHER EXCLUSIVE TORIT BENEFITS

- automatic filter-shaker mechanism is simple, maintenance-free
- different dusts may be collected separately
- highest air-to-cloth ratios (from 5 to 25:1) and longer filter life
- only ¾ H.P. required for fully automatic operation
- polished ¾₆″ aluminum construction for minimum floor loading
- modular design—5′ wide x 4′-8″ long (for two sections) x 15′-6″ high—saves space, lends ease and versatility to installation. Use up to 12 modular sections for each application! No limit to CFM capacity!



AUTOMATIC AND EFFICIENT, the filtering cycle of each TORIT section is self-timing. A separate blower on the clean air side keeps collector under suction. Then, (1) dust-laden air is taken into manifold; (2) coarse dust drops out; (3) fine dust is carried to filtering sections; (4) filter tubes catch dust on inside surfaces; (5) clean air emerges from filters; (6) to suction fan and clean air discharge outlet. (7) *Automatic* shaking and reverse air filter cleaning mechanism. (8) Conveyor *automatically* removes and discharges accumulated dust.

Have a cleaner plant, better morale and high productivity with lowest maintenance costs. Special design services are available based on your individual requirements. Write today for literature.

TORIT MANUFACTURING COMPANY

Automatic Collector Division, 1133 Rankin St., St. Paul 16, Minn., Dept. 534

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no-glare satin chrome finish. Graduations are in thousandths of an inch. The screw is precision ground with a 1-inch movement and the base is hardened, ground and lapped.

The L. S. Starrett Company, 1-165 Crescent Street, Athol, Massachusetts.

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One-Piece, Expanding Arbor Offers Simple, Fast Set-up

The Hughes Engineering Company's new On-The-Ball® one-piece, machinable head expanding arbors can be used for grinding and other cutting operations and for assembly and layout work.

These units can be mounted on any machine or fixture equipped with a standard 5C spindle nose and operated by a lever action collet closer. They are currently available with a 1½" diameter machinable head.

The patented tool works on a unique principle whereby arbor fingers expand on a ball to deliver maximum surface engagement to the work's internal surface. This action insures perfect concentricity and completely controllable gripping pressure.

Set-up is simple and fast. Once the arbor has been installed and turned to the required diameter it can be removed from the machine and replaced without affecting concentricity.

Hughes Engineering Co., 1658 Superior Ave., Costa Mesa, California.

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Coolant Contains Visual Efficiency Index

Rycosol 66, an effective coolant for cutting and grinding machines, contains a special color ingredient that offers visual proof of the solution's efficiency. It gradually loses its color as it becomes less efficient through continued use.

The solution can become completely colorless before the operator is in trouble. Then, to reactivate it, he merely adds a small amount of fresh Rycosol 66.

Reilly-Whiteman-Walton Co., Conshohocken, Pa.

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News from the Industry

Safety Pays Off—In Silver Dollars

Silver dollars reward good safety records in a unique program instituted in September by Metal & Thermit Corporation, Carteret, New Jersey. The plant employs about 200 people.

Silver dollars are given monthly to each employee based on the performance of that employee's safety group during the month. Similar departments and jobs have been classified as groups for the safety program. There are ten groups in all, each headed by a group leader and a safety leader.

Completion of a calendar month without a lost-time accident or doctor's case entitles each member of a group to two silver dollars. The group leader gets five silver dollars and the safety leader receives four. A doctor's case requiring no more than two visits reduces the flow of silver dollars to a trickle—one for everyone in the group. A lost-time accident or three or more visits to the doctor excludes the group from participation in the program for the month.

A comprehensive program of safety education is an important part of the new safety program. Each safety group meets monthly with its group leader and safety leader to discuss a pertinent safety subject. Failure of a person to attend means forfeiture of his participation in the reward program for the month.

The silver dollar program, initiated in September, will run for six months. Approximately $2500 will be distributed for a perfect safety record. Results will be reviewed and used to determine the next approach to the continuing task of striving for perfection in safety.

Diamond Sales Near Record For First Three Quarters

Sales of diamonds from African producers, reported quarterly by the Central Selling Organization in London, reached a near-record high for the first three quarters of this year. The 1960 sales through September 13 amounted to $185,626,064 and are exceeded in value only by sales during the same period of 1959 when total diamond sales amounted to $191,539,172.

Sales of gem and industrial diamonds for the third quarter of 1960 totaled $63,185,665. Of this total, gem diamond sales amounted to $44,105,043, down somewhat as compared with the third quarter of 1959 when gem sales amounted to $47,295,508.

Industrial diamond sales for the third-quarter period rose to $19,080,622, the highest third-quarter sales figure on record.

Open Nominations for 1960 Miniaturization Award

The 1960 Miniaturization Awards Committee is now receiving nominations for its fourth annual competition, **Horace D. Gilbert**, chairman, announced recently.

Established in 1957, this inter-industry event honors the individual, company or organization who has made the year's outstanding contribution to furthering the concept of miniaturization. In the words of Mr. Gilbert, president of Miniature Precision Bearings, Inc., the sponsoring company, the purpose of the Awards is to "stimulate activity within the industry by giving public recognition to the most significant achievements of the past year."

The Award itself consists of an original sculpture symbolizing miniaturization. In addition, certificates of excellence are given other outstanding entries. The winners are chosen by an independent committee of miniaturization experts representing industry, government and the technical press.

Last year, the competition attracted more than 100 entries from leading corporations, research centers and educational institutions. The winner was David A. McLean, component engineer, Bell Telephone Laboratories, Murray Hill, New Jersey, for his sputtered tantalum technique in producing micro-miniature components and circuitry. Previous winners were the Nuclear Division of the Martin Company for development of SNAP III, a five-pound radioisotope-fueled generator, and the Diamond Ordnance Fuze Laboratories for its use of photolithographic processes and printing techniques in producing transistors.

A kit containing detailed information for entrants, and other data on the Awards program is available from William Hutchinson, Secretary of the Awards Committee, Box 604, Keene, New Hampshire.

Entries for the competition should be submitted to the committee not later than January 10th, 1961.

Symposium Discusses Bacteria in Coolants, Cutting Fluids

The high cost of unwanted bacteria in industrial coolants and cutting fluids was discussed at "The Bacteriology of Coolants" symposium held at the University of Toledo, in Toledo, Ohio, on October 19. Lengthening coolant life by inhibiting the growth of bacteria was suggested as one method for reducing costs.

The symposium was sponsored by the Research Foundation of the University of Toledo, the Toledo Solvents and Chemicals Company, and Elanco Products Company, a division of Eli Lilly and Company.

Guest speakers at the symposium, and the topics covered, were **Richard DeLong**, Ph.D., professor in the biology department at the University of Toledo, "The Bacteria in Coolants"; and **Jerome Kimmelman**, M.D., Toledo dermatologist, "Dermatitis from Coolants."

continued

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TYPES
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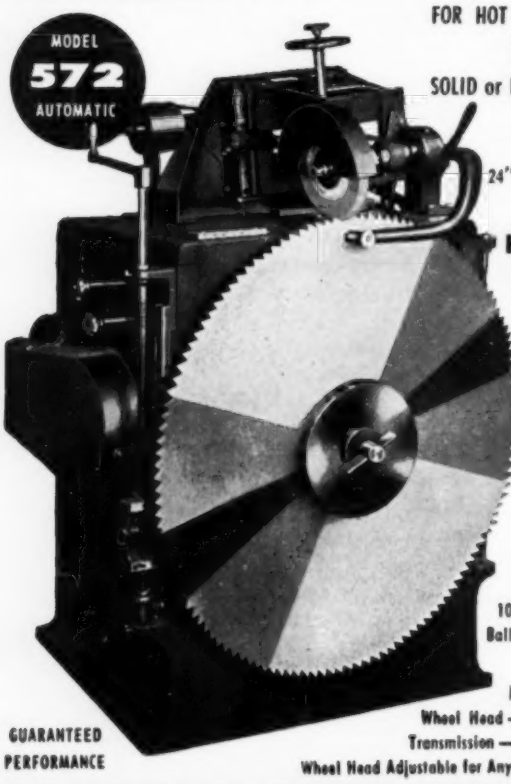

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Changing Faces . . .

Mark Taifer has been selected as manufacturing manager, Coated Abrasives Division, Armour Alliance Industries, Alliance, Ohio. He was formerly director of research and technical sales director for Abrasive Products, Inc.

Mark Taifer

Cosa Corporation, New York, New York, has recently announced the appointment of **Wallace E. Anderson** as vice president and general sales manager for all their imported precision and automatic machine tools. He was formerly with Brown & Sharpe.

W. E. Anderson

Appointment of **Calvin C. Weigold** as plant manager of the Reed Instrument Bearing Co., Los Angeles, California, a division of SKF, has been announced by Karl Kesselring, SKF vice president, manufacturing.

R. C. Miles

George L. Miller has been named purchasing agent for Firth Sterling, inc., succeeding Harry K. Stern, who has retired after 45 years of service with the company.

Raymond C. Miles has been promoted to director of the Engineering and Production Division of Airborne Instruments Laboratory (AIL), a division of Cutler-Hammer, Inc. He was formerly manager of the government products department with the Deer Park, L. I., New York firm.

At Chicago Pneumatic Tool Company's Franklin (Pennsylvania) plant, **John Kacmarik** has been named general manager, replacing H. E. Moore.

Thomas L. Griffin has been appointed regional engineer in Worcester, Mass., and the southern New Hampshire area for the Esbec Corporation, Stamford, Connecticut.

David E. Brown

New in the sales organization of Bay State Abrasive Products Company, Westboro, Massachusetts, are **David E. Brown,** in New Jersey, and **Robert N. Dickson,** in New England.

R. N. Dickson

New industrial-automotive sales representatives for The Black & Decker Mfg. Co. are **Larry H. Frazier,** Los Angeles, replacing **Ralph W. Long,** resigned, and **Robert E. Miller,** Chicago.

Appointment of **Francis B. McKee** as product engineer for the Reed Instrument Bearing Co., a division of SKF Industries, Inc., was announced recently.

Edward M. Armstrong is district manager of a new Dayton, Ohio, office of the Industrial and Machine Tool Division, Radio Corporation of America.

The unit, at 37 Park Avenue, will serve Ohio, Kentucky, Tennessee, Missouri, and Kansas.

E. M. Armstrong

G. E. Parker

The appointment of **George E. Parker** as assistant sales manager has been announced by the Cincinnati Milling Products Division, The Cincinnati Milling Machine Company.

Charles E. Reichel, for ten years a sales representative in Chicago, succeeds Parker as Chicago district sales manager.

Perry R. Roehm has been elected executive vice president of The Barden Corporation, Danbury, Connecticut.

C. E. Reichel

Paul A. Pitt has been promoted to vice president—engineering, of Solar Aircraft Company, a subsidiary of International Harvester Company. In this position, Pitt heads Solar's research and engineering activities.

At the same time, **Sumner Alpert** was selected as manager of a new division which includes Solar's aerospace, ground support and industrial products, with responsibility for sales and project engineering in these areas.

Appointment of **Richard B. Houghton** to the new position of vice president, engineering, for the California operations of Acoustica Associates, Inc., has been announced.

W. E. Essery

William E. Essery has become manager of sales administration, Coated Abrasive Division, Armour Alliance Industries, Alliance, Ohio. He was formerly with Mid-West Abrasive Company.

Earl D. Weaver has been appointed plant manager of Cross Perforated Metals Plant (Carbondale, Pennsylvania) of National-Standard Company's Reynolds Division.

W. B. Clark

William B. Clark has been named manager of manufacturing engineering; **Frank H. Rae,** chief process engineer; and **David Albert,** superintendent of inspection and quality control at Norma-Hoffman Bearings Corporation, Stamford, Connecticut.

Consolidation of the West Allis centrifugal pump department and the compressor department under the management of **E. F. Greiwe** has been announced by Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Frank H. Rae

Greiwe, who had been manager of the Norwood (Ohio) Works centrifugal pump department since 1958, is succeeded by **R. J. Dineen.**

Appointment of **C. F. Codrington** as manager of sales and **H. L. Ross** as manager of engineering in the new department has also been announced by the company.

Codrington had previously been manager of the compressor department; and Ross, of the West Allis pump department.

David Albert

C. L. Brisley and L. M. Dings, Jr., have been selected as chief industrial engineer and chief production engineer, respectively, for the West Allis Works, Industries Group, Allis-Chalmers Manufacturing Company.

continued

"how to drill the new, extremely hard metals and metallic materials"

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On The New...

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Diamond Impregnated

METORAM CORE BITS

These are the new Diamond Core Bits that assure economical coring and finish grinding of the new, hard metals and metallic materials required by modern industry. Now, it is possible to core tungsten carbide, silicon carbide, beryllium oxide, titanium molybdenum, silicon crystals, germanium crystals, etc. . . . and at a fraction of the 'cost-per-hole' experienced with ordinary methods.

Hoffman Metoram Core Bits drill with such accuracy that secondary lapping or finishing is frequently eliminated . . . make new, cost-saving production techniques possible. Keeping pace with the advances of modern metallurgy, Hoffman Metoram Bits are available for O.D. or I.D. requirements. Standard outside diameter sizes from 3/16" to 1-1/2"; inside diameter sizes from 3/32" to 1-13/32".

Each Metoram Bit is designed for the specific metal to be cored. Customer samples are tested FREE in Hoffman Laboratories. Let Hoffman recommend the right bit for your metal coring job.

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102 Cedar Street **Punxsutawney, Penna.**

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METAL CLEANING EQPT. SALES SPECIALISTS

for new Conveyorized Ultrasonics

We are now ready to enter into a full-scale National marketing program on our revolutionary AutoSonex metal cleaning equipment, and require the services of the most experienced, intelligent, and successful sales representatives in each marketing area.

AutoSonex is a new packaged cleaning machine which employs conveyorized ultrasonics to introduce automation to the cleaning process for the first time. It provides remarkable advantages in better, more efficient cleaning at significant savings of time, space, cost, manpower, and maintenance. Live inquiries from hundreds of manufacturers as a result of initial stories in various magazines give us reason to believe there is a vast, virgin market for this product—as well as for numerous additional products and applications now in advanced stages of development.

If you can qualify as a top man with the ability for creative sales engineering and determination to do a top job, please write today in detail, outlining territory covered, experience and background, and if you are an individual or organization. Your reply treated in strictest confidence.

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Abrasive specialist to appoint industrial distributors.

Top line of diamond wheels available on exclusive basis in some major industrial areas.

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"Abrasive & Carbide Cutting Tool"

Specialist with large following in the East, seeks one additional major line. Must be partially established. Have office and warehouse facilities.

Reply to Box No. 36
GRINDING & FINISHING
WHEATON, ILLINOIS

NEWS OF INDUSTRY *continued*

Appointment of **David P. Ebaugh** as chief of the Industrial Engineering Department, Automation Product Division of Nytronics, Inc., has been announced.

David P. Ebaugh

Joseph P. Foley

Joseph P. Foley has been named marketing manager for the Electronics Division of Van Norman Industries, Inc.

Gustaf R. Peterson has been appointed to the sales staff of AA Gage Co., Detroit, Michigan, to coordinate AA Gage's design and manufacturing departments with customer needs and schedules.

Around the Industry . . .

Stevens Moves to Wallingford

As part of an expansion program designed to improve its ability to serve metal finishing and foundry customers in the New England area, Frederic B. Stevens, Inc. has moved its plant from New Haven to Wallingford, Connecticut.

The new Stevens installation is located at 440 South Colony Street, Wallingford, Connecticut.

Grimes Engineering Buys LeCount Tool Works

The Grimes Engineering Corporation, Cheshire, Connecticut, designers and manufacturers of machine tool accessories, has recently announced the acquisition of LeCount Tool Works, Inc., of West Hartford, Connecticut.

Most of the LeCount production operations will be combined with present Grimes operations in Cheshire, but no change in the present LeCount sales organization has been contemplated. Eventually a new plant will be constructed to house both production operations.

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TOOLROOM ACCESSORIES

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- Complete Line—4 New Models of Adapters Available
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CAUTION!

This word will appear next month on the wrapper around each copy of Grinding and Finishing to remind you readers that . . .

JANUARY is VERIFICATION MONTH

Circulation auditors require certain information about every reader to qualify him as a recipient of Grinding and Finishing. The protective wrapper around your January issue will contain a form to be used to give us this information. Proper completion of the form and prompt mailing to us in your company envelope will assure your continued receipt of this magazine. We will appreciate your help.

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GRINDING and FINISHING

De Beers Announces Commercial Output of Synthetic Diamonds

De Beers Consolidated Mines, Ltd. will produce synthetic diamonds in South Africa for industrial uses, it was announced by **Harry Oppenheimer,** chairman of De Beers, world's leading producer of natural diamonds.

De Beers revealed last year that it had perfected a method for the production of synthetic diamond. The South African concern has not previously produced the artificial diamond in quantity.

"At the present time," the announcement continued, "there are ample stocks of natural diamond grit for the world market. In view, however, of the interruption of diamond mining operations in the Congo, the production of synthetic material is being undertaken to ensure that there will be no break in supplies to the market."

Stevens Represents Wyandotte in New England

Wyandotte Chemicals Corporation, J. B. Ford Division today announced the appointment of Frederic B. Stevens, Incorporated, as a distributor for Wyandotte metal cleaning and finishing products in the New England area. Stevens already is handling the Wyandotte line in the midwest.

Stevens will maintain a complete stock of Wyandotte metal cleaning and finishing products for the New England area in its new warehouse facilities in Wallingford, Conn.

Optical Gaging Products, Inc. Acquires Detroit Concern

Announcement was made recently by W. DeBoer, president of Optical Gaging Products, Inc., of the acquisition of the assets of Automated Reproductions Company of Detroit, Michigan, developers of methods and equipment for plastics etching on plexiglass, vinyls, butyrates, and styrene. Plans are being made to transfer this operation to the Optical Gaging plant at 26 Forbes Street, Rochester, New York.

Optical Gaging Products, Inc., is a wholly-owned subsidiary of Ex-Cell-O Corporation, Detroit, Michigan.

Geoscience Instruments Named as Carborundum Distributor

Geoscience Instruments Corporation, 142 Maiden Lane, New York 38, N.Y., has been appointed a distributor for The Carborundum Company, Niagara Falls, New York.

The firm will concentrate on servicing metallurgical and petrographic laboratories, as well as the electronics industry.

The G. I. C. line will include a broader selection of powders, papers and cloths than has been previously available to the industry. Local distribution points and one-day service will aid quick delivery.

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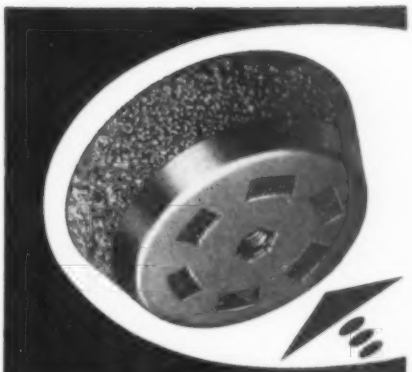

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THE THRO-A-WAY HUB

Completely do away with adapters and their associated inventories, cost, and wasted time. Our bonded-on hub is amazing . . . why not inquire?

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AIRETOOL'S 400G

cuts grinding costs

Designed for heavy duty, small wheel grinding. Powerful air motor stands up . . . without heating up . . . under continuous grinding of large dies, castings and patterns. Easy to handle; cuts operator fatigue; boosts production.

Accurate. Tailored for precision die grinding, accurate metal removal and other intricate grinding operations.

Versatile. Collet Chuck uses wide range of rotary mills. Wheel adapter (illustrated) makes abrasive wheel mounting easy for fine finishing of inside surfaces. Spindle models available.

Threaded Adapter For use with ¼" Collet Chuck

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TUMBLING MEDIA

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Preforms in over 300 shapes, sizes and bonds for all barrel and vibratory operations.

- Finest bonding materials
- No "roll-over" of burrs
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Free lab service reports proper media for your parts.

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Black & Decker Opens 50th Factory Service Branch

Black & Decker Manufacturing Company opened its 50th factory service branch—and the third in metropolitan Chicago—at 10708 South Western Avenue, Beverly Hills, Chicago 43, Illinois. Eugene E. Huff is acting manager.

The company's first two factory service branches were opened in New York and Boston in 1918.

Skinner Chuck Becomes Skinner Precision Industries

Stockholders of The Skinner Chuck Company, New Britain, Conn., voted on October 4th to change the name of the Company to Skinner Precision Industries, Inc.

In announcing the change of name, Paul K. Rogers, President, pointed out that Skinner's Board of Directors, in recommending the change, did not overlook the historical and highly reputable name of The Skinner Chuck Company. This will be retained by the designation of the Chuck Division as Skinner-Horton Chuck Division.

The name of the Valve Division will remain the same—Skinner Electric Valve Division.

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for nationally known manufacturer with economy-priced line. Generous commission. Write telling other lines handled, territory covered, etc.
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Wheaton, Illinois

Belt Grinding Termed Thrifty Sheet Resizing Method

Abrasive belt grinding or flat polishing, usually thought of as a production method for processing sheets of stainless or titanium, also has potential for savings in sheet salvage.

According to Earl D. Hoskin, service engineer for Michigan Abrasive in Detroit, steel slightly thicker than is needed can be economically ground down to required thickness by this process. Also, when the only steel of the required gage available is scratched or marred, the process may be employed to up-grade its surface quality.

Flat polishing is a machining process in which abrasive belts are used to perform a combined metal-removing and surface polishing operation. Using a multiple headed flat polisher it is possible to remove from 0.0015" to 0.003" of metal in one pass, enough to reduce its size to the next smaller gauge, at a cost of less than one cent per pound.

Many large-volume manufacturers, the automobile industry for example, have their own flat-polishing installations. Anyone who does not have a flat polisher can have the work done by

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the diamond tools with a **NEW TWIST!**

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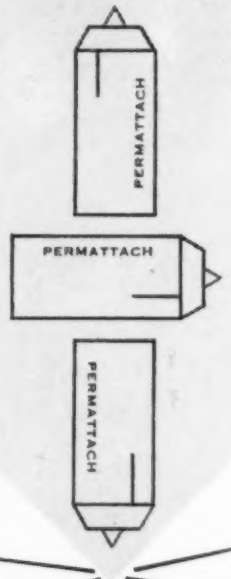

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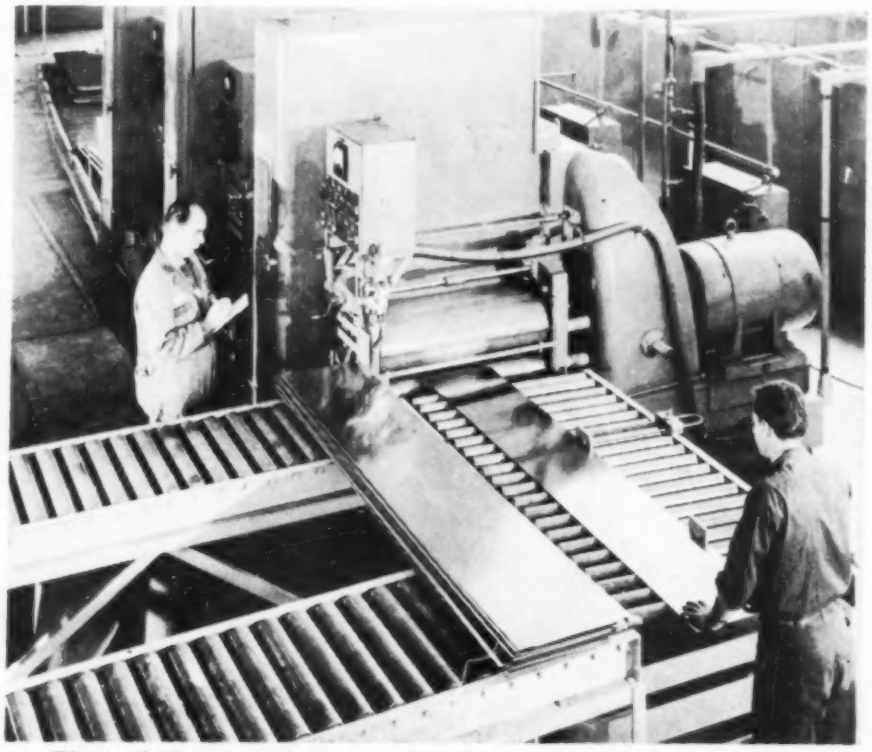

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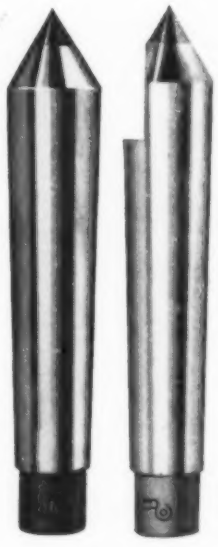

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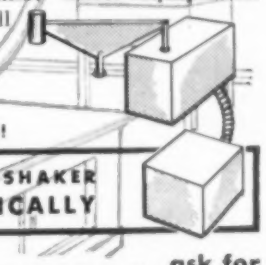

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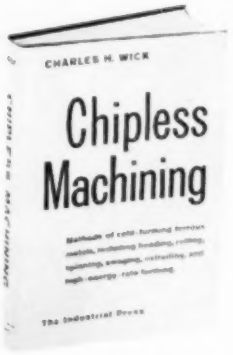

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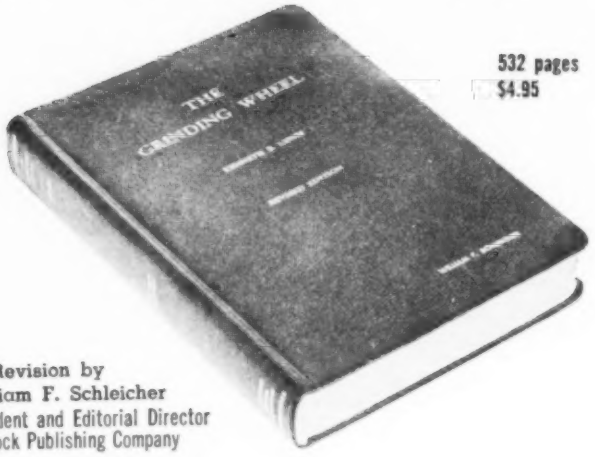

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GRINDING and FINISHING

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New method of using more of the power available reduces belt costs, increases accuracy and output on wide belt operation.

26 **How Planning Built a Modern, Efficient Barrel Finishing Department at Shakespeare**

Examples display planning and applications of barrel finishing in one of the country's most modern finishing departments.

30 **What Are the Grinding Characteristics of Tool Steels?**

Tool Steel groups have their own peculiar grinding requirements.

35 **What Do Your Diamond Wheels Cost? Man-Made and Natural**

For companies who are unable to test or study wheel cost, test figures provide comparative information.

40 **At Timken—While Carbide Tool Use Increased, Tool Room Grinding Decreased.**

Timken increased the use of carbide tools by their automatic screw machines but decreased tool grinding costs by electrolytic grinding.

Coming Next Month

The State of The Industry

For the third year leaders in the industry will comment on developments and benefits which can be of help to users of grinding and finishing processes.

How to Finish Flame-Plated Coatings

The accepted methods of finishing flame-plated coatings are covered completely, including speeds, feeds, and abrasive specifications.

Can Heavy Components Be Deburred by Vibratory Barrel Finishing?

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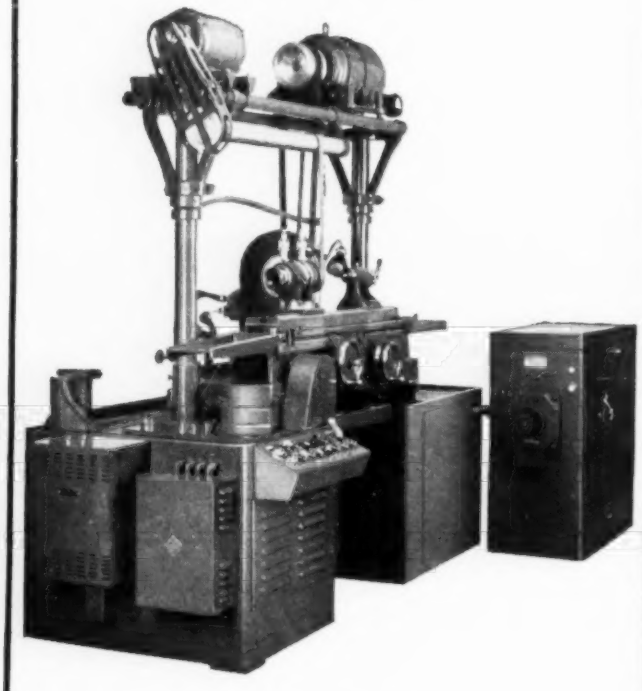

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What is the First Law of Business?

The first law of sound business management should be intelligent frugality. A business in which the luxury of spending is viewed as a means to obtaining practical, beneficial results is a healthier operation than the business which carries about with it the dear pleasures of wasteful appropriations and extravagant expenditures regardless of maximum benefits to be derived therefrom. Frugality and intelligent expenditures are to a business what leanness and muscles are to an athlete.

But frugality is not penny pinching. Fiendishly hacking off appropriations in an effort to save money rather than as a means of streamlining production is merely hacking at the muscles of the athlete as well as the fat. No mutilated athlete ever won anything except a hospital bed; penny pinching businesses don't win much more.

When expenditures are to be made the intelligent manager asks: . . . of an expenditure for new equipment, Will it increase production? By how much? . . . of the cost of hiring additional managers, Will the managerial force achieve objectives faster? Will it release men for deployment on special projects? . . . of an advertising appropriation, Will it reduce salesmen's calling time? Will it increase sales?

When these questions are answered affirmatively the expenditure is approved. Frugality expects a just return from each investment; equipment is bought, production methods are streamlined, advertising campaigns reduce sales costs, wages are increased to reduce the expense of labor turnover, and a hard hitting, ambitious organization secures its place in the sun.

But what of the nickel and dime boys? Ah, you know them well; frugality carried to absurdity. No expenditures for new equipment, but a large maintenance crew to keep the old wrecks clanking another day . . . no well-paid managers, only mediocre talent, the intelligent and ambitious find other jobs . . . no advertising campaigns, but a high sales cost . . . no intelligent handling of salesmen's commissions, only expensive low sales volume . . . what, hire a firm of consultants to analyze our business? Listen, young fellow, I've been in this business for a good

many years, and I guess I know how to run it. I don't hold with these fancy specialists. We're doing O.K.

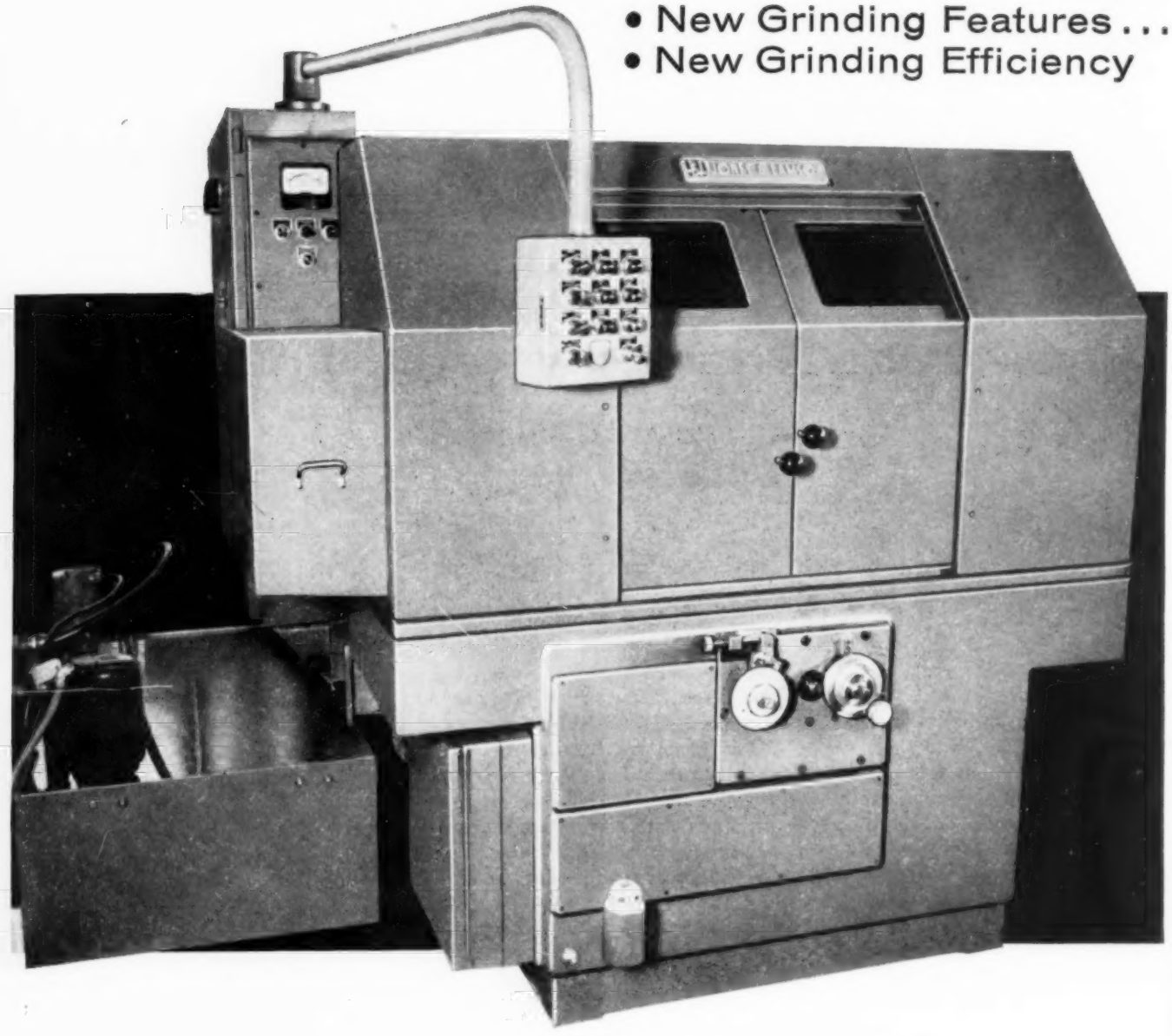
The penny pinchers are easily recognized; a high labor turnover, an apathetic sales force, low production, inferior equipment, a mediocre product. Penny pinching is a disease which spreads its poison into every vein and organ of the body. It corrupts initiative, corrodes teamwork and causes dissension and disunity. It never results in the full development of a company.

Let us have instead, intelligent frugality. Send forth a dollar so that it may return leading little dollars by the hand. A healthier, better business will result. Hack off the fat, yes, but save the muscle.

Wm. A. Schleicher

Vice President & Editorial Director

• New Grinding Features . . .
• New Grinding Efficiency



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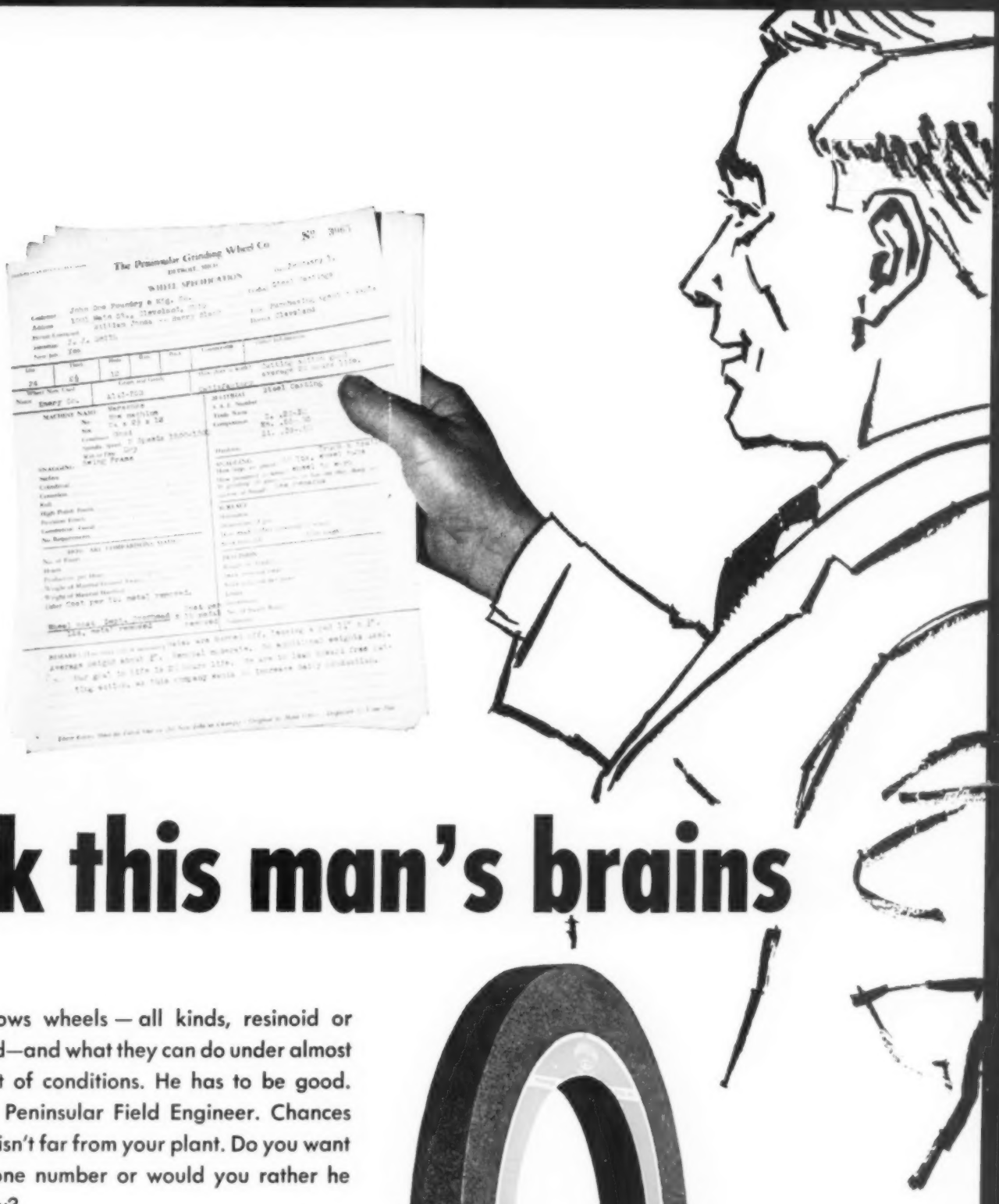

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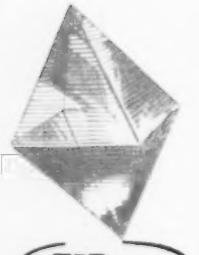

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